FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

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Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list—

1929.

Dec. 6 ... No. 3 Sqdn. R.F.C. and No. 3 (F) Sqdn. R.A.F. Reunion Dinner, Hotel Cecil.

Dec. 12 .... "The Development of Materials for Aircraft Purposes," Lecture by Dr. W. Rosenhain before R.Ae.S. and Inst.Ae.E.

1930

Jan. 22 .... "The Strategical Mobility of Air Forces," Lecture, by Gp.-Capt. C. L. Courtney, before Royal United Service Inst.

Mar. 5 .... "Air Co-Operation with Mechanised Forces," Lecture, by Wing-Com. T. L. Leigh-Mallory, before Royal United Service Inst.

June 28 .... Royal Air Force Display, Hendon.

Sept. 6–28 .... Aero Exhibition, Stockholm, Sweden.

EDITORIAL COMMENT

IT is not our custom to refer, in these columns, to matter appearing in our advertisement pages, but very occasionally some quite exceptional announcement is made which seems to call for comment. Such a case occurs this week in connection with the announcement of the de Havilland Aircraft Company that as from December 1 next the firm will undertake to repair, free of cost to the owner, any light aeroplane damaged in making a forced landing as a result of failure of a de Havilland "Gipsy" engine. We imagine that never in the history of aviation has such an offer been made, and doubtless there will be those who become suspicious and begin to look for the "catch."

Faith

In order to make the position quite clear, it may, therefore, be as well to examine in some little detail exactly what the offer means.

When, more than a year ago, it was decided to put a "Gipsy" engine through a reliability test, it was hoped that a period of 600 hours might be completed by the engine without any overhaul whatever. It is now well known that the test succeeded completely, the "Gipsy" engine doing its 600 hours' flying in a "Moth," and covering something like 51,000 miles. At the end of the test the engine was stripped and carefully examined. Generally speaking, it was in excellent condition, and such few parts as had begun to show appreciable wear had already been redesigned before the end of the test, and are now incorporated in all "Gipsy" engines. As a result of this, the de Havilland Aircraft Co. has absolute faith in the reliability of the engine, and has now decided to make the offer of free repairs.

We understand that the details of the scheme are now being worked out as regards the drafting of the conditions as a proper legal document, but in the meantime a broad outline may be of interest. As the offer will apply on and after December 1 next, machines purchased before that date will, naturally, not be eligible for inclusion. The indemnity to be offered will remain in force for 12 months after

delivery of the machine and engine, and is not to be confined to " Moths " only, although, very naturally, certain stipulations will be made such as, for instance, that the engine must be installed in a British aircraft which possesses the British Certificates of Airworthiness and Registration. The indemnity will cover machines with C.'s of A. in the " aerobatic " as well as the " normal " category, and only when the machine is being used in Europe for private flying, training, taxi work, and any ordinary flying. Racing, record-breaking attempts, and experimental flying will not be covered by the indemnity.

In these days of quite considerable second-hand markets in aircraft it is of interest to point out that the offer applies, generally speaking, to the original purchaser only of a new aircraft and engine, although we understand that on the sale of an aircraft to another owner the de Havilland Company may, at its discretion, agree to a transference of the indemnity to the new owner.

The indemnity offered will be restricted to such mechanical engine failures as are due to the engine parts manufactured under the control of the de Havilland Company itself and under their guarantee. The reliability will not, therefore, cover such items in the engine installation as the magnetos and plugs, carburettor, petrol and oil pipes, and similar items which are subject to the guarantee of other manufacturers.

It is almost superfluous to add that one of the stipulations made is that the engine must have been properly maintained in accordance with the instructions laid down in the " Gipsy " handbook, and that the repairs for which the firm offers to pay must be carried out in accordance with the instructions of the de Havilland Aircraft Co.

Bearing in mind the fact that the " Gipsy " may be fitted in any of a number of different light 'planes, and that the machine may be flown by pilots of indifferent skill, the offer is, as it seems to us, a very handsome one, and one which could only have been made as a result of the utmost faith in the mechanical reliability of the engine

The " fly in the ointment " is fairly obvious. After a crash during a forced landing, it may on occasion be a somewhat difficult matter to ascertain with certainty the part or component which caused the engine failure, and even if this thorny question is settled to the satisfaction of all concerned, there is still room for differences of opinion as to whether or not an engine has been properly maintained " according to the book of words." However, those who have had business dealings with the de Havilland Aircraft Co. in the past will doubtless feel that they can count on a fair and square interpretation of the conditions. The new move is one to be welcomed from all points of view.

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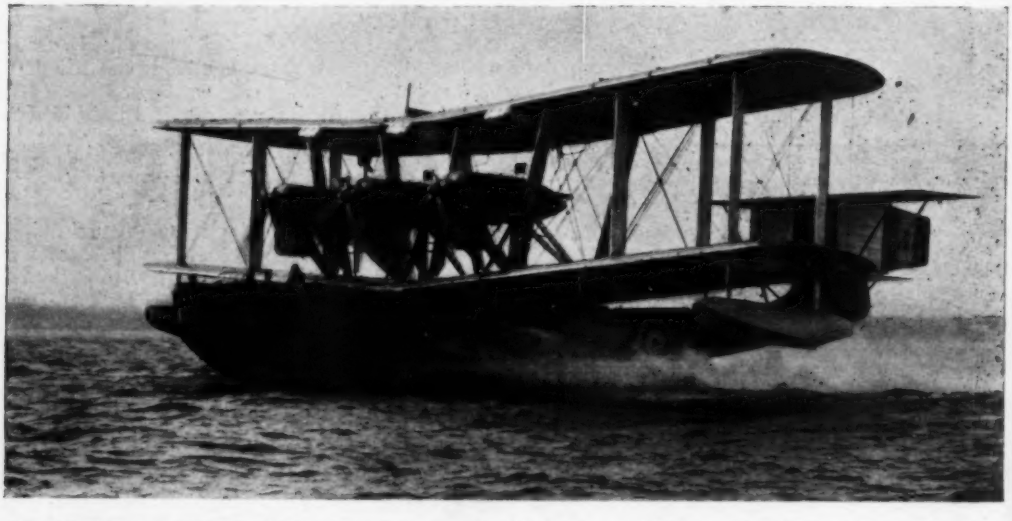
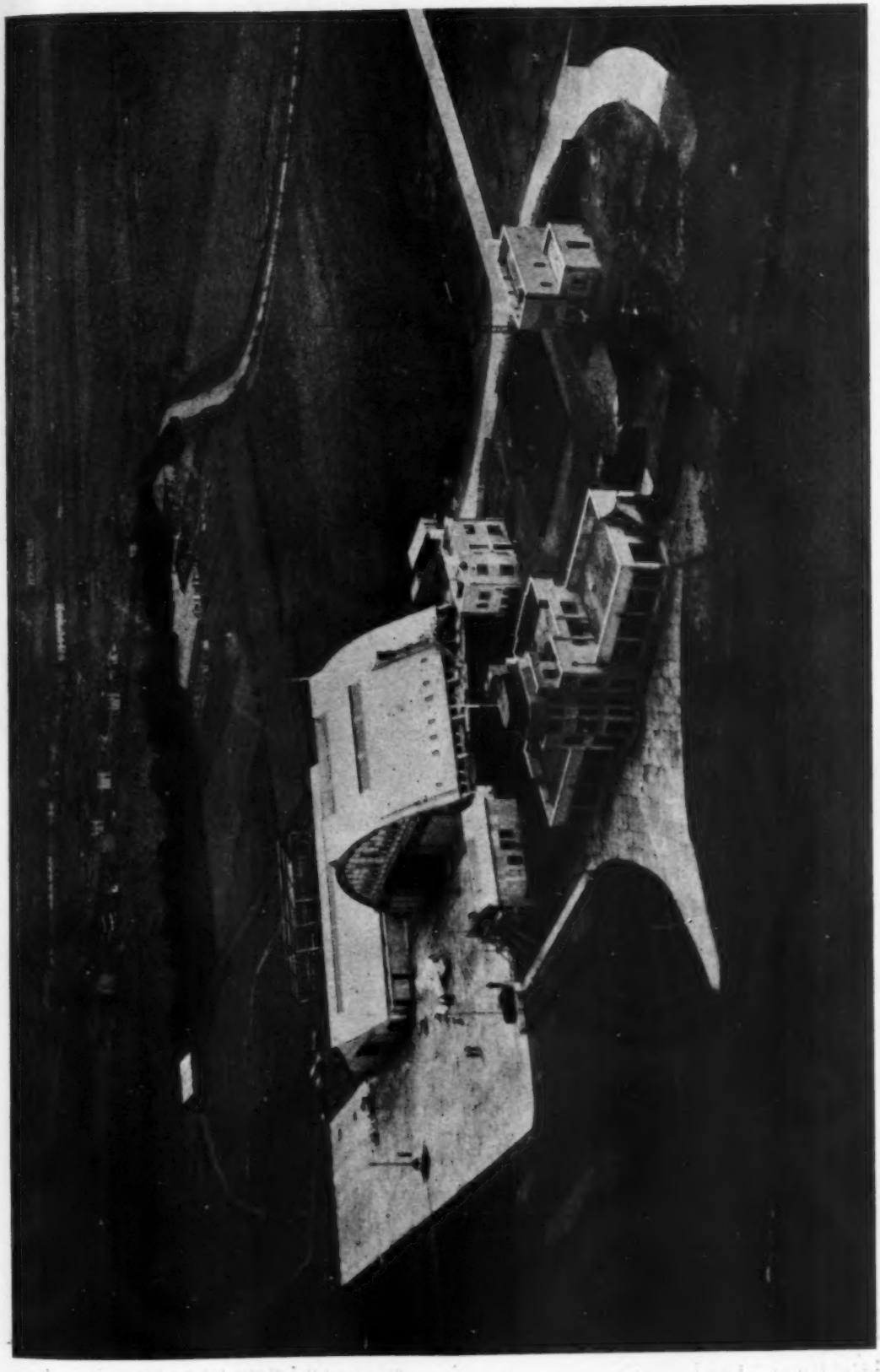
Mailplanes

We have stated in these columns repeatedly that we do not regard the use of one type of aeroplane for passengers, mails, and goods as the most economical way of using aircraft on the Empire air routes. The time is overdue when we should be specialising, and as air mails are likely to be, for some time, the most important sphere of activity, the air mail machine should be developed. The Germans have seen this, and the fast long-distance flights which were carried out on an Arado monoplane with B.M.W. " Hornet " engine have indicated what can be done in this direction. Berlin–Constantinople in 10½ hours is a useful commercial speed. The machine used was, we believe, similar to that exhibited at the Berlin Aero Show in 1928, and is normally a passenger-carrier Probably it was converted for the mail flights. We would go farther even than the Germans have done. For the Empire air mail routes we would use single-engined machines of high aerodynamic efficiency and high cruising speed—say some 135 to 140 m.p.h. They can be produced. Will the D.C.A. look into the matter ?



THE BLACKBURN " IRIS III " : The latest model of this type, built to order of the Air Ministry by the Blackburn Aeroplane and Motor Co., Ltd., was successfully launched at Brough on November 21. The new " Iris," which is of all-metal construction, has three 700 h.p. Rolls-Royce " Condor " engines, and weighs a matter of some 13 tons. An unusual feature of this machine is the provision of a gunner's cockpit at the extreme rear of the hull, immediately behind the tail 'planes. Sqdn.-Ldr. Rea, accompanied by Mr. W. D. Marriott, Mr. McCallum (representing the Air Ministry) and Maj. J. T. Rennie, of Blackburn's, carried out the launching flights last week, after which the flying-boat proceeded to Felixstowe to undergo service trials. (FLIGHT *Photo.*)

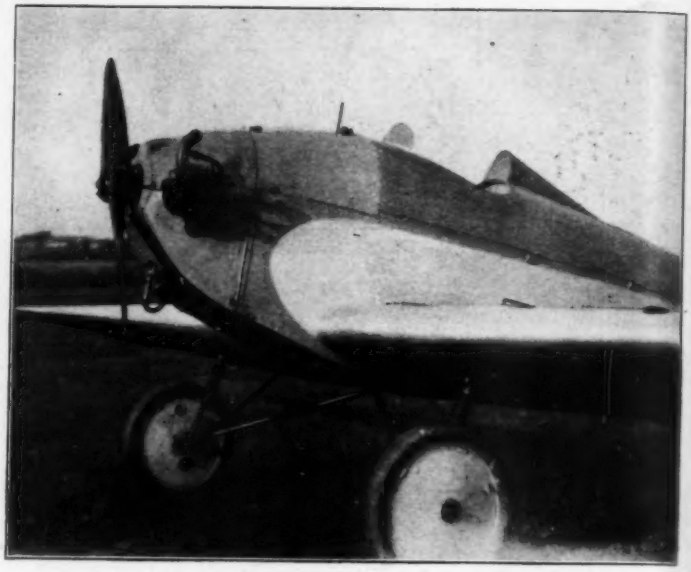


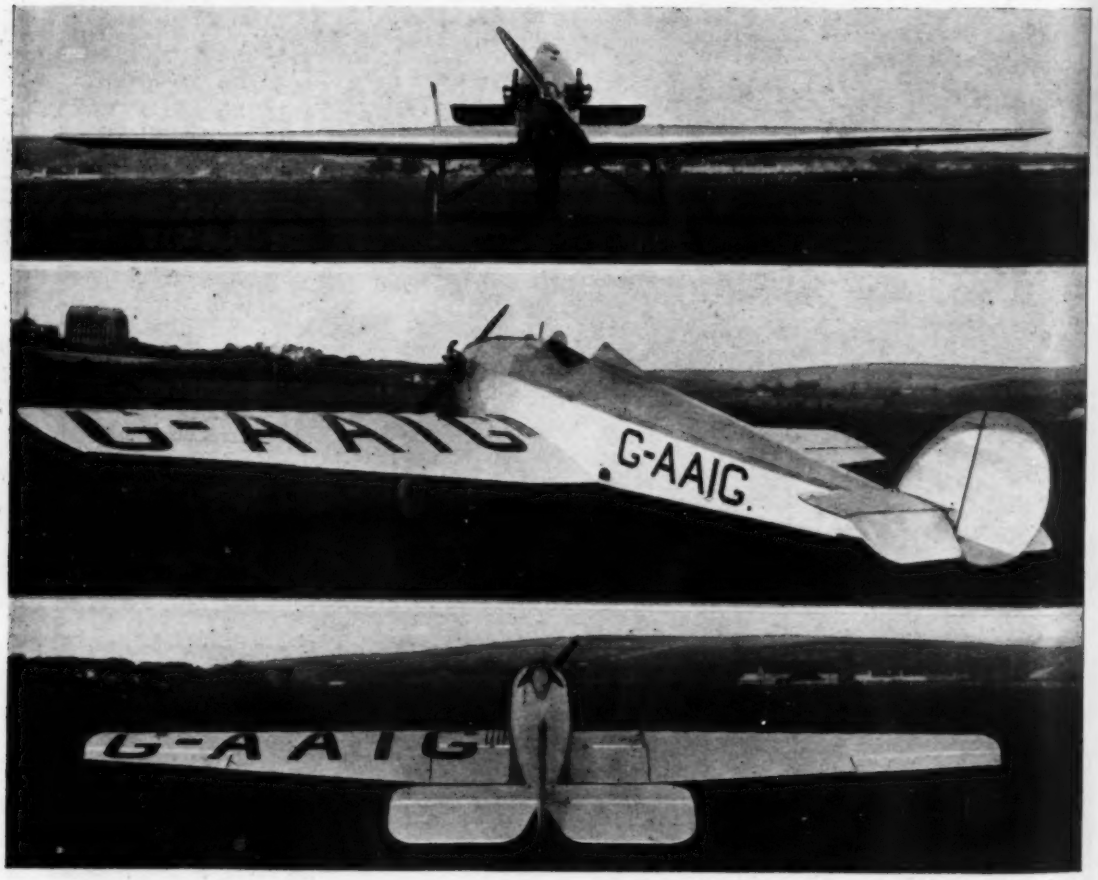
HESTON AIR PARK : A view from the air showing the carefully thought out grouping of the hangars and administrative buildings. The large concrete hangar has the offices on an upper floor and the low hangars contain private lock-ups.

THE "HENDY HOBO"

ALTHOUGH he has had to work under somewhat unfavourable conditions, Mr. Basil B. Henderson, Managing Director of the Hendy Aircraft Co., of Shoreham, Sussex, completed the little single-seater light 'plane, which he calls the "Hendy Hobo," about a month ago. On its first test flight, Mr. Percival took the machine straight off the ground without any preliminary straights, and found it to answer the controls perfectly. So much so that, already on this first flight, the pilot flew the machine "hands-off."

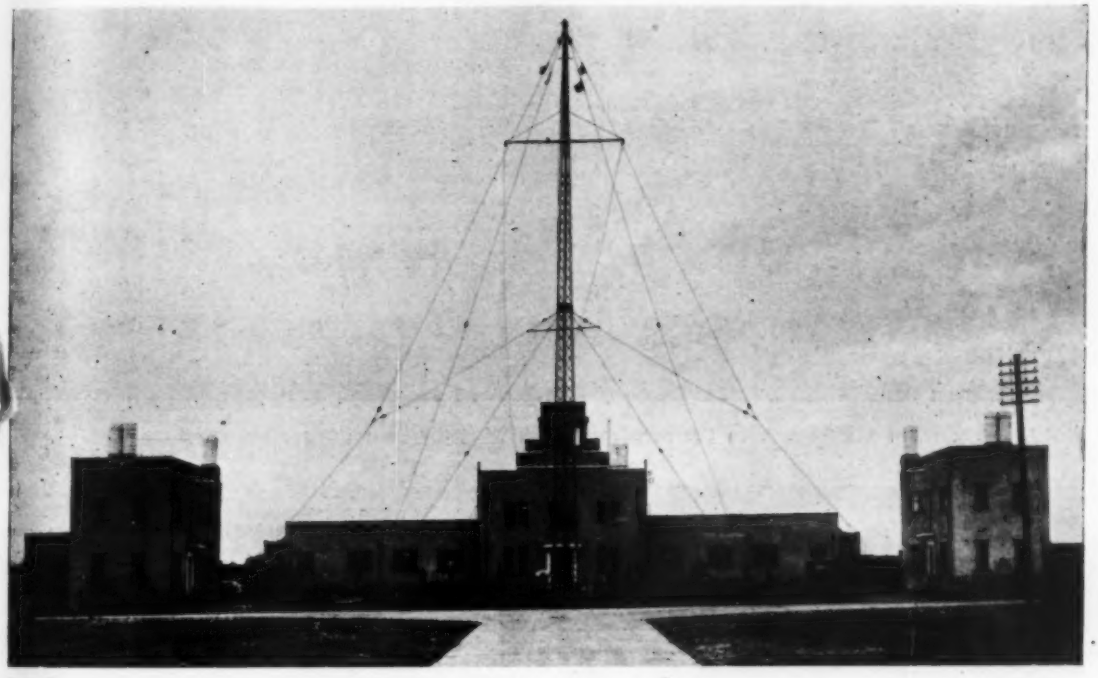
The general features of the machine can be seen in the photographs, and it will be observed that the "Hendy Hobo" is a low-wing cantilever monoplane. The wing is designed to fold, and the two halves of the undercarriage support the wing roots. Owing to the wide track, the machine can be taxied about on the ground in very small circles without turning over. The engine is an A.B.C. "Scorpion," which has been found to run extremely smoothly.





Large span, low span loading, with consequent small induced drag are features of the "Hendy Hobo"

PRIVATE FLYING AND CLUB NEWS



The entrance to the main buildings from the road.

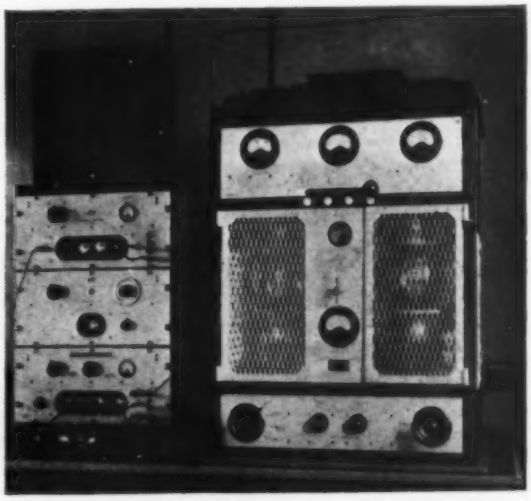
HESTON AS A WIRELESS STATION

HESTON AIR PARK wireless broadcasting station was formally opened by Sir Sefton Brancker on Monday, November 25. It was, perhaps, unfortunate that the day was such a rough one, but, in spite of the gale, the programme was adhered to and everything went off with great success.

A few weeks ago we illustrated and described the form of receiving apparatus which Alfred Graham have designed for light aircraft and it is this receiver which was fitted in the Moths used for the opening demonstration.

Captain Sinclair of Alfred Graham, is chiefly responsible for the air side of the installation, and Capt. Elford for the ground installation. The transmitting set used is the type G.A.5, ¼ kw. set, and works on 764 metres. It has been designed to meet the needs of the smaller type of air ports which require to communicate with aircraft in their immediate vicinity, and to broadcast weather reports and keep in touch with the machines up to about 100 miles. It is designed also, to work direct from the mains, and the generator in this case is enclosed in a sound-proof box so as to obviate any interference from this source.

Apart from disseminating news about the weather for the benefit of private owners, this wireless installation will be used for instruction on the lines that were explained in our previous article. This method was demonstrated by Sir Sefton Brancker, who directed the two Moths which were lined up on the tarmac to start-up, and subsequently he told them to take off, and proceeded to direct their manœuvres in the air, from his position in the control tower, finally bringing them down to order. Further demonstrations were given by Capt. Baker, the chief instructor to Airwork, Ltd., but, as the wind was so high, it was considered inadvisable to have pupils piloting the machines, as had been originally planned, and consequently Capt. Baker's "pupil" was his assistant, Mr. Winsor.



THE TYPE G.A.5. SET: The transmitter is on the right, and the receiver on the left.

The main buildings from the aerodrome. Showing the control tower and aerial masts.

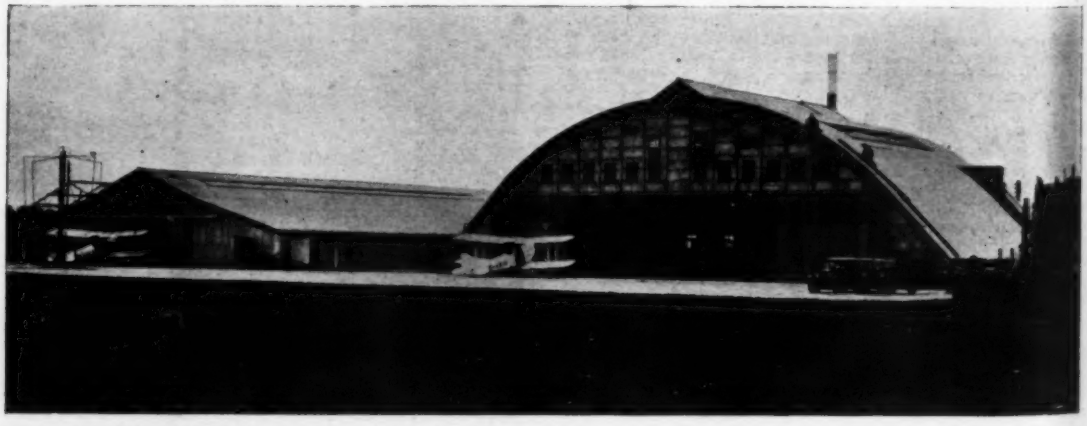
The sheds housing the demonstration machines of three firms.

By having this set, Heston becomes, not only the first thoroughly modern and exceptionally well-planned and equipped aerodrome, which owes its being to and is still run by, a private firm, but it will also be the first to use wireless telephony for primary instruction in flying.

It is hoped that before long many of the coming municipal aerodromes will be similarly equipped, and then the private owner with the necessary receiving set will be sure of getting reliable weather reports in any part of the country. In this connection it may be mentioned that Heston is provided with the A.A. weather board, and can, therefore, give reports at any time.

It was also made clear that Heston will now be a recognised Customs port, with a resident customs officer, and the Air Ministry are desirous that it shall become the clearing port for air-taxis and private individuals flying to the Continent. This will relieve the congestion at Croydon, and keep such traffic clear of the regular air liners.

Mr. Norman and Mr. Muntz, the directors of Airwork, Ltd., who are responsible for Heston Air Park therefore appear to be already at this early stage thoroughly justified in their enterprise, and there seems every chance of Heston becoming the port for all commercial work, apart from air-line traffic.



THE HANGARS AT HESTON. On the right the large hangar has the offices on an upper floor, and the hangar on the left contains the private lock-ups. The main hangar is of concrete construction, by Mr. A. C. M. Jackaman, of Slough, who himself is an enthusiastic private owner.

NATIONAL FLYING SERVICES arranged a demonstration of the new Desoutter-Hermes 3-seater cabin machine during the last week-end, November 22-24. Invitations had been sent out during the previous few days to many people who would be likely to be interested, and a large attendance was hoped for but, as so often happens in England, the weather turned out very bad on the Saturday, which rather marred things; however, some 40 people did actually try the machine during the three days, and from what one hears, the majority seem to think that N.F.S. have done a wise thing in standardising this type for their taxi service. Many months ago, when this machine was put on the market by Mr. Marcel Desoutter, we said that now, at last, there would be available, the type of machine most suited to our climate and, moreover, a type which private owners who fly because they wish to get from somewhere to somewhere, and not just because they like the sport, would be wanting before very long. There were naturally many who said this was the wrong view, and that the open machine would always be more sought after, but, taking a line from the history of road transport, we saw no reason to doubt that comfortably closed-in machines would eventually be in greater demand than the open unprotected type. Assuming that the design is such that the pilot has a good view, there can be little doubt that the enclosed machine is the type that has come to stay, and very few who can afford the slight extra cost will be willing to put up with the discomfort of the open cockpit machine.

THE ILLUSTRATED PRESS GO FLYING: Our picture shows, from left to right, Mr. A. S. Frene and Capt. Alan Bott (of the "Graphic"), Mr. and Mrs. De Groot (Editor of the "Bystander"), at the Desoutter Sports Coupe demonstration at Hanworth. (FLIGHT *Photo.*)

The Desoutter not only provides the comfort of the saloon car, but it also provides an extremely good view for both pilot and passengers. The pilot sits in front of the passengers in a single seat on the centre-line of the machine, with the two passengers sitting side-by-side behind him, and in such a position that they can see all the flying instruments, and can converse with him, or amongst themselves, with the greatest of ease.

When one looks back at the normal type of light aeroplane, it seems a matter for wonder that this enclosed type has been so long in coming into being. The Desoutter gives the advantage of enclosed comfort, carries three persons, with the two passengers sitting side-by-side, and has a performance roughly the same as the standard open two-seater type and, moreover, does it all with the same engine as is used in the former type!

The writer counted himself lucky, in that he went down for the demonstration on Saturday, when the weather was by no means ideal, because he felt that a trial of such a machine, which it was proposed to use for taxi work, would be of far more value when the weather was bad than under really good conditions.

Mr. Gordon Selfridge, Mrs. Lovell and Mr. Desoutter at Hanworth.

It would obviously not be a business proposition for taxi work if the machine were exceedingly uncomfortable when the weather was bumpy, so that users would be tied to really fine weather, but we need have had no fears on this score. The machine was one of the most comfortable it has been one's luck to fly in when at all bumpy, and when we saw a light aeroplane of the open type being chucked about good and hearty, as we came down, we realised just how comfortable and stable the Desoutter was.

The controls were somewhat heavier than the ordinary machine, but certainly not too heavy; the degree of heaviness required is one which no two pilots ever agree upon, but personally, one preferred the "feel" of the Desoutter to any other light aircraft one has tried. Even when bumpy, there was no trouble in holding her without effort, and it is possible to fly hands and feet off for considerable periods.

The view the passengers have of the surrounding country is certainly not bettered by any open-type machine, and though the pilot's view seemed slightly restricted, when taxying, due to the fairly large ground angle, he said that this was only apparent, and that from his seat it was as good as any other machine. One criticism we can level at this machine—to save this description from becoming a sycophantic eulogy—is toward the padding of the passengers' seat; this was definitely uncomfortable, it may be that one's "personal" padding is somewhat thin, but we should not have liked to have made a long trip in the machine as it was; this may seem a small point, but to those not used to air travel, it is the small points of personal comfort which attract them to, or otherwise mar a particular machine, and it seems a pity that such a machine as the Desoutter should be spoilt for such a little matter as this. The first machine we believe had a type of hammock seat, which was particularly comfortable, no doubt Mr. Desoutter had a very good reason for altering this, but it does seem a pity to have done so.

This standard model has been greatly cleaned up since it first came over from the Koolhoven works as the F.K. 41, and now all parts are made in accordance with the best English practice. With the Hermes engine, it has a top speed of 110-114 m.p.h. and a cruising speed of 98 m.p.h. The fuel capacity has been increased, and there is still sufficient for four hours' flying.

The faith that N.F.S. have in this type is shown by the fact that they have placed an order for 70, and their justification is assured by the number of real enquiries which they

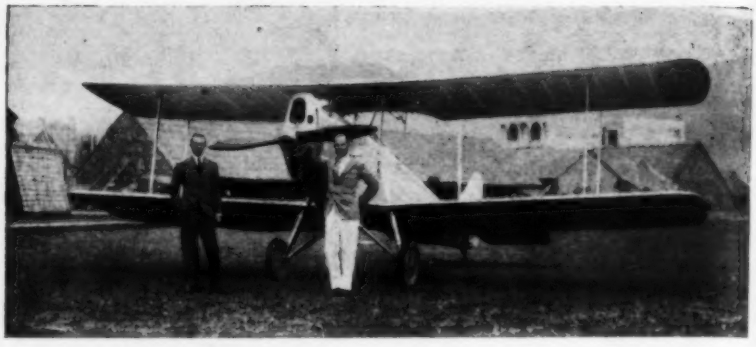
have already had for this machine. There can be no doubt that this is the machine for all those who have to travel about on business, at least one well-known newspaper is on the point of deciding to get one—may we see many more follow their example—and for taxi work, it is hard to see what real arguments can be raised against it.

THE CINQUE PORTS CLUB were unable to keep up their previous record flying time for the week ending November 23rd as the weather has been very bad indeed. A small amount of excitement was caused on Wednesday, the 20th, when a cylinder head cracked on a machine in which Mr. Brown was giving a pupil instruction; having plenty of height, however, he was able to make the aerodrome and bring off a good landing. The Club's other machine, which had been overhauled, was, however, luckily ready the same day.

THE NORTHAMPTONSHIRE AERO CLUB have struck an original idea by holding an Aerial Beagle Meet at Sywell on Saturday, November 30. Mr. Noel Lloyd, the Master of the Pipewell Foot Beagles, has issued the invitations and flying visitors are asked to arrive at 12.30.

THE NOTTINGHAM CLUB will probably be joining forces with N.F.S. shortly, if the negotiations which are now under way are carried through successfully. The Municipal Aerodrome at Tollerton, which is only four miles from the market square, will be leased to N.F.S., and the club will operate there instead of at Hucknell.

THE PLYMOUTH AERO CLUB is starting to make itself felt in the district, and it is hoped that in the near future invitations will be issued for members. They are being helped by that sportsman Mr. Parkhouse, who flew over recently from Teignmouth to give them the benefit of his experience and counsel. He said that during the last 18 months he had sold six machines so that there were distinct possibilities in the district, and he pointed out that with the exception of London the aeroplane can compete with the train service to anywhere from Plymouth, and to emphasise which he cited a few of the recent occasions on which he has been asked to convey passengers arriving by liner at Plymouth to the North. As Teignmouth is the only instuctional aerodrome near Plymouth Mr. Parkhouse is obviously taking a long view, in helping the establishment of the Plymouth Club, which should encourage aviation in the whole West Country by its activities, instead of endeavouring to take the business from them himself as might have been done by one less far-seeing than he is. When Plymouth is properly established as an airport there should be great possibilities in providing air transport for such people who, arriving by ship, wish to go straight up north without touching London.



AT THE KAI TAK AERODROME, HONG KONG: The "Avian-Hermes" of the Far-East Aviation Co. Mr. Smith (in white trousers) is a director, and Mr. Vaughan Fowler is manager and pilot.

THE BROOKLANDS SCHOOL OF FLYING held their first annual dinner and dance at the Thames Riviera Hotel last Saturday, November 23. The dinner was largely the result of a desire, on the part of the Directors of the School, to repay the Northampton Club for their help and their well-known hospitality, which all who have visited Sywell have experienced.

About 85 guests accepted and the arrangements were admirable, both the dinner and dance being enjoyed by all.

An evil genie with a sense of humour evidently thought that those arriving in cars were like unto Noah's flock so by arranging a breakdown of the electric ferry he made sure that they should enter the island, two by two, and no faster. This made the dinner rather late, and so the defection of the original chairman—who was further delayed by a bad-tempered steed—went more or less unnoticed and Capt. Davis himself took the chair, but though called upon he firmly refused to give the heaviness of a "function" to the proceedings by allowing much in the way of speeches and the cheery spirit was maintained right up to the "bacon and eggs" stage.

It seems appropriate here to recall the fact that it is just over a year since Capt. Davis and his staff took over the Henderson Flying School and the Brooklands School of Flying came into being. Since that day great strides have been made and the school is now one of the most popular there is, and even during the present weather there is no lack of enthusiasm and pupils are being enrolled all the time, which disproves those who think the winter is no good at all for flying. The following figures will show that much hard work has been put in, which has brought its own reward in the number of finished pupils turned out and the popularity of the School.

In this year's working 1003¼ hrs. dual instruction have been given, and 274½ hrs. solo and 420 hrs. 10 mins. for joy-riding have been flown, making a total of 1697 hrs. 55 mins. Of the joy-riding time a good deal has been used in cross-country flights and specially chartered flights. 7905 passengers have

THE FIRST CANADIAN AIR PAGEANT AT MONTREAL: The U.S. Army Curtis PI's are formating on the left. On the left is a Ford Tri-motor, while next to it are two Lockheeds, with N.A.C.A. cowling and speeds of about 190 m.p.h. The one with the dark fuselage is Capt. Hawks' transcontinental record machine.

been carried (exclusive of pupils), 22 aircraft sold and three first prizes gained by pupils at various flying meetings.

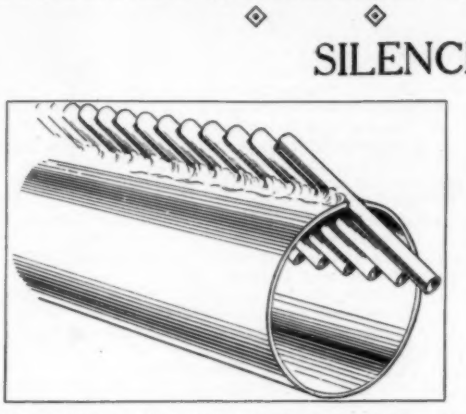
Forty pupils have gained their "A" licences and four have been trained for the Auxiliary Air Force and finally, at the present moment there are 85 pupils under instruction; all of which must be considered good cause for the Staff of the School to congratulate themselves most heartily, but knowing their retiring natures we are sure they won't do so, so we must do it for them.

PHILLIPS AND POWIS AIRCRAFT, of Reading, have written to point out that they know nothing of the developments which were reported last week as pending at Reading Aerodrome. The report which was taken from a usually reliable source, did not specifically state that this firm was connected with these developments nor did our mention of the matter do so, but as they now definitely announce that they have no fresh negotiations on hand, we willingly give space to this in order that no misconstruction may be put on such a report.

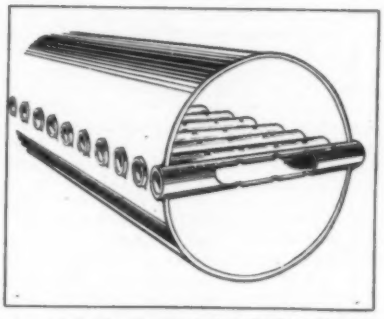
MR. ROY TUCKETT met with a mishap at Aboukir when the machine in which he was attempting a flight to Capetown from Cairo was wrecked after being accidentally started.

Mr. Tuckett himself was laid out for some time, but was apparently not permanently incapacitated.

Reports vary as to the actual cause of the accident, but as far as we can gather what happened was that the contact-breaker cover had been removed, which, of course, had the effect of "switching on," and the ground engineer, not knowing this, swung the airscrew with the throttle open in order to suck in, and as he did so the engine started up. He got clear under a wing, but Mr. Tuckett, who endeavoured to get to the cockpit to close the throttle, was knocked down and stunned. He has announced that he will continue the flight when the machine has been overhauled.



SILENCERS



FOLLOWING on the article entitled "Silence" which we published last week, we are now able to illustrate a new form of silencer which is being marketed by Mr. Turner.

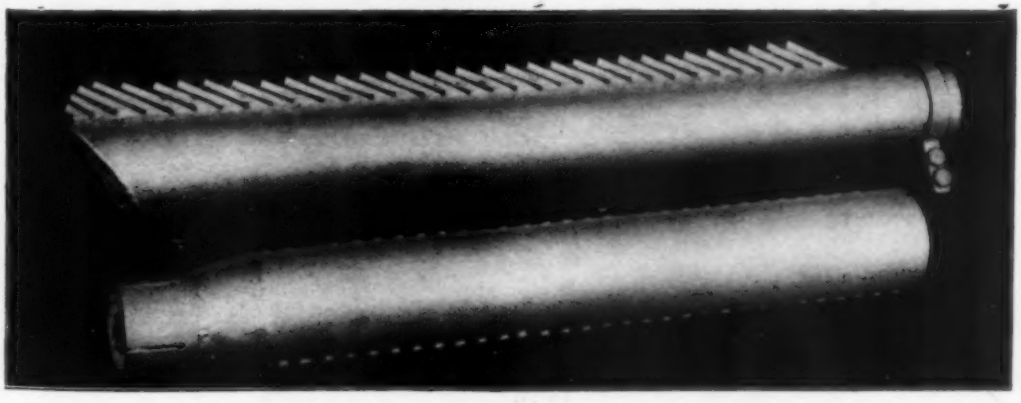
This is called the Harmonic, and has been used with considerable success on various aircraft while in its experimental stage. The models in the photo are for motor-cycle use, but those intended for aircraft are essentially the same in construction, and the photo, together with the sketches, will serve to show the internal arrangement.

The upper type, jocularly called the "Pipes of Pan," is merely a series of small tubes, open at each end, which are welded, at an angle, into holes in the exhaust pipe. The size of this portion of the exhaust pipe is the same as the rest and of the same gauge, so that the actual silencing arrangement adds very little weight. The tubes are inserted on the side remote from the fuselage and facing aft, and it is claimed that the slip-stream causes a very definite suction effect in the tail pipe. This point seems debatable, but on officially carried out tests the back pressure caused by this form of silencer was less than that obtained in the normal open-ended tail pipe.

One has had the pleasure of flying in a machine fitted with this silencer and can vouch for the fact that it certainly does make a vast difference to the comfort of one's ears.

The second type, though it has not been tried out to the same extent as the other, is said to be the more efficient, and consists of small tubes inserted through the tail pipe as before, but in this case the necessity for welding is obviated by simply drilling the tail pipe straight through and then slightly swaging over the ends of the small tubes. These tubes are drilled internally with small holes, and, as in the first type, the end of the tail pipe is sealed. This second type has the added advantage of a flush exterior, which is very desirable on many machines, particularly those where the exhaust pipe runs along the side of the cockpit and the pilot has to climb over it when getting into the machine, as in many ordinary light aircraft used by private owners.

We hope later to be able to publish the results of actual experiments with these silencers, and should also welcome any correspondence or articles on the subject, as we feel that among the many sides of aviation that of silence has been developed the least of all, and it is undoubtedly a development which will have to come about in order to make public travel in aircraft really attractive—especially in long-distance flying.



AIRISMS FROM THE FOUR WINDS

Slotted Wings in the Guggenheim Competition

CONSIDERABLE controversy has arisen, it is reported, regarding the use of slotted wings in the Guggenheim Safety Competition. Mr. F. Handley Page has lodged a protest with the contest committee against the admission in the competition of the Curtiss entry, on the ruling that "the employment of design features which in the opinion of the Fund (the Daniel Guggenheim Fund) are copied from the design of another competitor, may render the aircraft ineligible for entry." On the other hand, the Curtiss Co. claim that the Handley Page entrant carries infringements of the Curtiss patents!

Ontario Air Forest Patrol

THE Ontario Provincial Air Service has, during the past season, flown approximately 850,000 air miles, or about 11,500 flying hours, starting on May 1 last. The season's work constitutes a record in the history of the service, 5,400 more flying hours having been achieved than in 1928. A feature of the season's operations is the fact that the record has been achieved without injury to a single member of the personnel or to a single passenger, in spite of the fact that flying has taken place during one of the worst fire hazard years in the history of the Department of Lands and Forests. The Forest Patrol covers the vast area of northern Ontario from Lake Superior to James Bay, and was able to perform many valuable services in connection with bringing help to stranded expeditions, and in conveying injured or sick persons from outlying trading posts to hospital. Most of the 'planes are now at the Sault Ste. Marie base for refitting and overhauling, in readiness for the 1930 season. Only two of the many stations from which the aviators battled with the bush fires this exceptional season remain open at present—those at Fort Frances and Kenora.

The Next Paris Aero Show

IT has been decided that the Twelfth International Aeronautical Exhibition, organised by the Syndical Chamber of Aeronautical Industries, will be held at the Grand Palais, Paris, during the month of November, 1930.

Bristol Municipal Aerodrome

BRISTOL'S municipal aerodrome, which is located at Whitchurch, on the city boundary, will be opened on January 1 next. The Bristol and Wessex Aeroplane Club will move to this aerodrome from Filton, where they have up to now had their headquarters, as soon as the ground and buildings, etc., are ready. It is claimed that Whitchurch will be one of the largest municipal aerodromes in the country, and it is hoped that it will become the centre of civil aviation for the West of England.

Aircraft Over Poland

ON September 23 last, new regulations came in force in Poland concerning the entry into and passing over Poland by foreign aircraft. In pursuance of these regulations, every aircraft proceeding to Poland or passing over its territory should be provided with a certificate containing necessary particulars of the aircraft, its crew, passengers and cargo. The Polish Consular representatives abroad are authorised to issue such certificates. The aircrafts of countries which acceded to the International Air Convention of 1919, or aircrafts which belong to countries which concluded air agreements with Poland, will receive the said certificates immediately and free of charge from the above-mentioned Polish representatives. An exception constitues military aircraft or other State aircraft, whose entry into Poland, or passing over its territory, is to be settled by way of diplomacy. Commercial transport of passengers and cargo by aircraft requires, in Poland, a special licence from the competent authorities. Regarding entering Poland or passing over Poland of private aircraft of other countries, the persons concerned should apply to the Polish Consular representatives abroad, who will, in each case, communicate with the competent Polish authorities with a view of obtaining the licences.

Costes and Bellonte Back

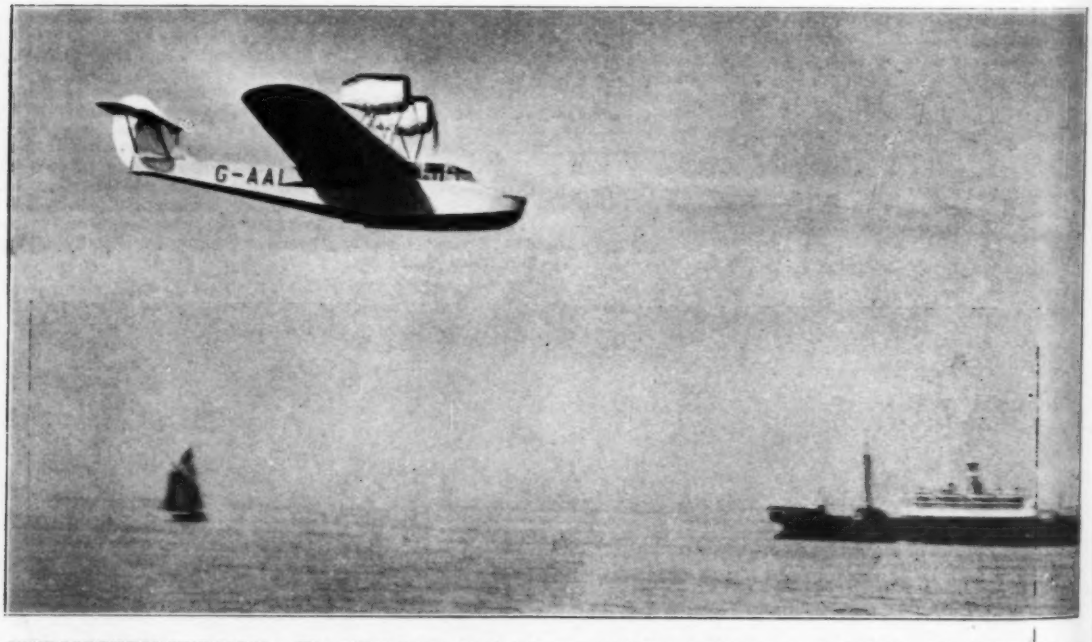
MM. COSTES AND BELLONTE, who recently flew non-stop from Paris to Manchuria, arrived at Le Bourget on November 21, having accomplished the return flight from Hanoi in four and a-half days.

U.S. Schneider Pilot Killed

LIEUT. G. T. CUDDIHY, one of the U.S. Navy pilots who flew in the 1925 Schneider Trophy Contest, was killed when he crashed in a Bristol machine he was testing at Washington, on November 25.

Vickers Aircraft for Irish Free State

THE Irish Free State Air Force has ordered a number of "Vespa-Jaguar" aircraft from Vickers (Aviation), Ltd.



THE MODERN VERSION: The old "Cutty Sark" was one of the most famous of the China Tea Clippers. The Saunders-Roe "Cutty Sark" is just as much of a thoroughbred. A four-seater, with "Cirrus-Hermes" engines, she should be almost the ideal "Air Yacht."

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

November 29, 1929

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EDITORIAL VIEWS

Although nowadays structural failure is almost unknown in British aircraft, the subject of structural design is not one whit less important than it was in the earlier days of flying. We can never know too much of the subject of stresses in our structures, and although the methods which experience has enabled us to evolve have in the main proved successful in that they have made it possible to build machines that do not break up in the air, they are not, perhaps, of quite as rational a nature as might be desired. Mr. A. E. Russell, who is in charge of the Stress Department of the Bristol Aeroplane Company, has written a very interesting and instructive article on the subject of load factors, the first instalment of which appears this month, and he points out the loose way in which the terms "load factor" and "factor of safety" are used, even in technical reports. It was, we believe, Mr. J. D. North who coined the phrase "factor of ignorance," a term which is very expressive, as well as containing a good deal of truth. It is hoped that Mr. Russell's article will do something towards not only a clearer distinction between "load factor" and "factor of safety," but also a better understanding of the magnitude of loads which various manœuvres may impose on the structure of an aircraft.

Col. Blyth, Part I of whose article on "Spinning" was published last month, returns to the subject in the present issue, and brings the article to a close with a consideration of the part played in the spin by the aeroplane itself (the first part dealt with the wings only). Col. Blyth's exposition of the subject may not altogether meet with the approval of the "highbrows," but, as it is intended for those in our aircraft drawing offices who have not studied the phenomenon in detail we think it will be agreed that the author has managed to bring a great deal of lucidity into a subject which is, to many, one of considerable difficulty.

It is with great regret that we have been compelled to divide Mr. Kearley's article on the engines at Olympia, but our space is limited, and there was no help for it. Next month Mr. Kearley will take up the subject of the water-cooled engines at the Show.

LOAD FACTORS.

By A. E. Russell, B.Sc., A.M.I.A.E.

First I should like to explain the difference between a load factor and a factor of safety, for even in Technical Reports, each is made to do service for the other. Perhaps an example would be the simplest way to commence. Consider a lift at rest and suppose there would be structural failure if loaded with weights equivalent to 20 people, *i.e.*, 20 units. However, suppose there is only room for 10 people inside the lift. The lift under this condition of loading might be said to have been designed to a load factor of 10 and a safety factor of two.

The above case is obviously not one that could be taken as a criterion of strength, since the lift must move and in stages of motion it must accelerate, and we all know that an acceleration produces a force called an inertia load, moreover this force is directly proportional to the acceleration. This is expressed in Newton's third law of motion as Force = Mass × acceleration or $F = \frac{w}{g} \alpha$. Going back to the lift, assume that it is stationary, the 10 people being supported by the lifting motor. If five people jump out the lift immediately rises. We have now a force of 10 units applied to a weight of 5 units, which induces an upward acceleration of 2 g. The nett acceleration is only 1 g. since the other 1 g. is balanced by the acceleration due to gravity.

In this case, although the lift has but five people in it, so long as the acceleration of 2 g. continues there is still only a reserve factor or factor of safety of 2·0. The five people if suspended on a spring balance during this acceleration would register the same weight as 10 people statically weighed, so that the lift may be said to have a load factor of 2—on the 5 units—and a factor of safety of 2·0.

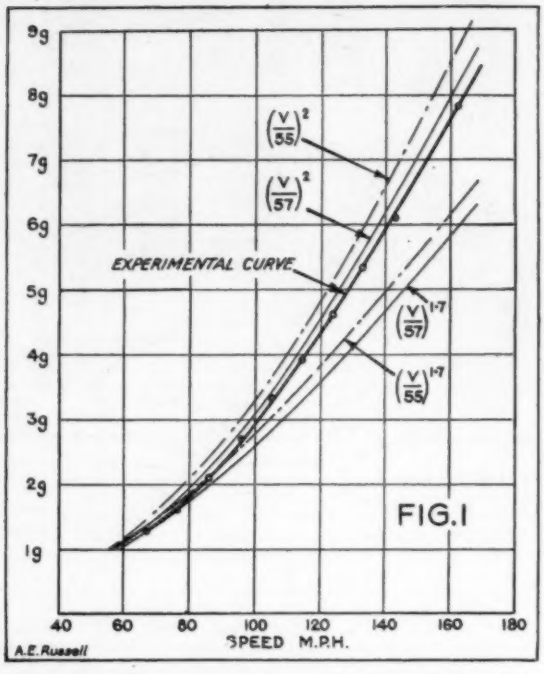
Turning our attention to aeronautics. The lift on an aeroplane wing is expressed by the simple formula

$$L = k_L \rho S V^2$$

Where L is the lift

k_L the lift coefft.
ρ density of air (value 0·00237 for English units).
S wing area in square feet.
V the airspeed past the wing in ft. per sec.
Considering the variable k_L, the lift coefft.

This is almost a straight line plotted on an angle of incidence base so that if the angle of incidence is 10° above the angle of no lift we get twice as much lift as when the angle of incidence is 5° above no lift at the same forward speed.



DIVE AND PULL OUT: Curve showing theoretical and actual load factors on a Fokker P.W.7.

When an aeroplane is flying level at a constant speed the lift of the wings and other surfaces is exactly equal to the weight of the machine, and this is unit load on the wings.

There are two ways in which this lift may be increased to produce an acceleration. The engine power may be suddenly increased by opening the throttle, the forward speed increases, and the lift goes up as the square of the speed, the lift is greater than unit load or the machine is subject to a load factor greater than unity. The manner in which a much larger load is imposed on the structure is by suddenly altering the wing attitude to the wind by elevator movement. If the machine is flying at an angle of incidence of 2° above no lift and the nose is suddenly lifted so that the angle of incidence becomes 8° above no lift, there is approximately four times as much lift on the wings and a load factor of four on the machine. In the following investigations of various manœuvres we shall see how this change of attitude subjects the machine to high accelerations and gain some idea of the design factors required for different types of aircraft.

Pulling out of a Dive

The operation of pulling out of a dive is a very simple one and has been studied analytically and experimentally on several occasions. The method is for the aeroplane to be dived at a constant speed, the pilot jerking the stick back with the greatest possible rapidity. Manifestly if the angle of incidence reaches the maximum lift instantaneously before time elapsed for loss of speed the load on the wings would be

$$L = k_L \text{ max. } \rho S V_o^2$$

but the weight $W = k_L \text{ max. } \rho S V_s^2$

where Vo is the speed of the dive

Vs is the stalling speed.

Then $\frac{L}{W} = \left(\frac{Vo}{Vs}\right)^2$

So apparently, if it were possible to instantaneously manœuvre a machine in a terminal dive of say 240 m.p.h. into an attitude corresponding to stalling speed say 60 m.p.h. the load factor on the wings would be 16.

In R. & M. No. 706, Dr. A. J. Pippard studies the question in more detail and gets a modified result. He finds that the load factor is a function of $\left(\frac{Vo}{Vs}\right)^{1.7}$

Fig. 1 shows some results of experiments carried out at McCook Field, and also theoretical values. It is apparent that the correct stalling speed should be used when calculating load factor, the two values taken 55 m.p.h. and 57 m.p.h. indicate this clearly. In this set of results $\left(\frac{Vo}{Vs}\right)^2$ gives the nearer value; with a stalling speed of 57 m.p.h. the difference is only 3½ per cent.; with a stalling speed of 58 m.p.h. the calculated and experimental values would be approximately the same.

Pulling out of a dive can be considered from a different aspect. The load factor as already stated is dependent on change of attitude of the aircraft and this change of attitude is controlled by the pilot by varying his effort on the control column. In R. & M. No. 1232, S. B. Gates, M.A., and H. B. Howard, B.A., B.Sc., derive a simple formula connecting the pull, extra to that required to trim, on the control column, with the load factor. The equations of lift and pitching moments in terms of the angle of flight path and the incidence from no lift are integrated after assuming no loss of forward speed until the maximum load factor is attained: this assumption we see by Fig. 1 is justified by the close agreement of the experimental values with $\left(\frac{Vo}{Vs}\right)^2$. The important result is given in the formula $n = \frac{\gamma P}{FW}$

Where n = the load factor.

P = change of force on the control column.

W = weight of the aircraft.

$\gamma = A \cdot \frac{a_2}{b_2} \cdot \frac{\text{hinge moment}}{\text{force on stick}}$

$F = B\left(\frac{\rho\, glS}{W} + C\right)$.

A, B, C, constants for given aeroplane.

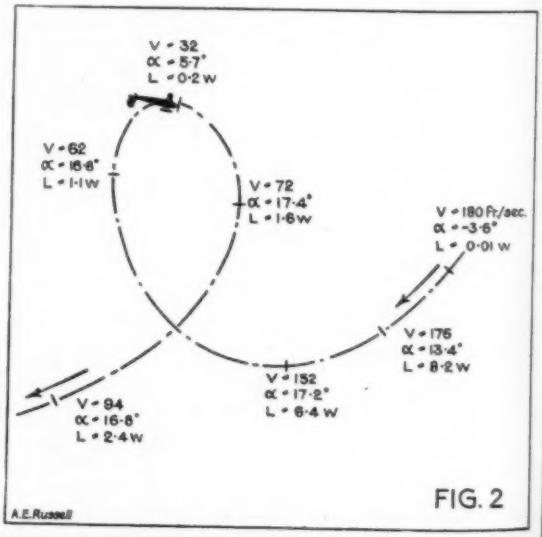
This formula shows:

(1) n is independent of the longitudinal moment of inertia.

(2) For an aeroplane of given weight, tail volume and C.G. position, n is independent of the speed of the dive for a given pull.

(3) For a given pull P, n is inversely proportional to the weight of the aircraft.

(4) n increases with the height of the manœuvre.



Form of calculated loop with variation of speed and load on wings.

(5) For similar aeroplanes of given loading in which the gearing of the elevators is constant $\frac{n}{P} \propto \frac{\gamma}{Fl^2}$, $\gamma \propto \frac{1}{l}$, F is of the form $Dl + E$ so that $\frac{n}{P} \propto \frac{1}{l^2(Dl + E)}$ or n decreases rather faster than the inverse cube of the linear dimension.

(6) $n \propto \frac{a_2 P}{b_2}$, where a_2 and b_2 are constants in the tail plane characteristics: If the control is lightened by balancing part of the elevators b_2 is largely affected while a_2 remains practically unchanged. For instance, b_2 is halved when one-fifth of the area of the elevator is balanced so that n is doubled for the same pull, P, on the stick.

Values of n obtained when this formula is applied to different aircraft vary greatly with the type. For instance, a single-seater fighter gave a value of $\frac{n}{P}$ of 0·41, while a two seater training machine gave 0·15. Impossibly high values are given for small aircraft owing to the assumption in the analysis that the linear relation between k_L and α continues indefinitely.

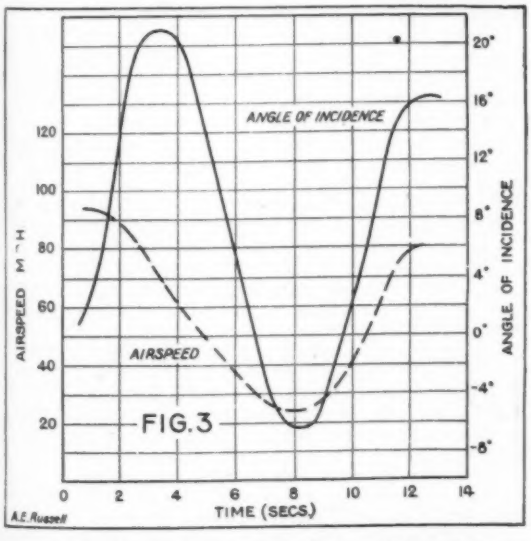
It is apparent that large and rapid changes of effort on the part of the pilot produce high load factors in recovering from a vertical dive.

It is also of interest to note that if a large effort is required to hold the machine in the dive, release of the control column is equivalent to a change of force which may result in a structural failure.

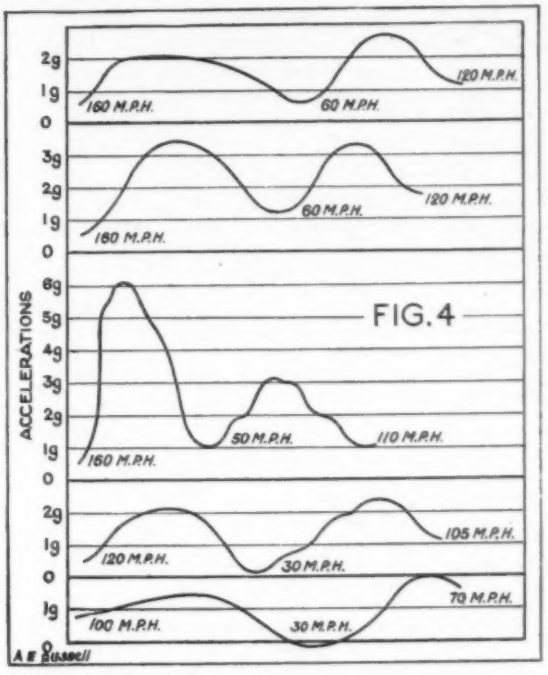
The second stage of the pull out may be said to be the loop, so we will next investigate this.

The manœuvre involves only a rotation about one axis, obviously however the loop is not a steady one. If a mathematical analysis is made it is necessary to proceed by the method of step by step integration, assuming constant conditions to persist through a short interval of time (usually of the order of one-fifth second), calculating the change of speed, angle of incidence, etc., during that interval, and then applying the changes thus calculated as the initial figures to proceed with at the next step. This method can be applied to any manœuvre, but is tedious and only resorted to when other methods fail. Fig. 2 shows the form of a calculated loop.

The aeroplane is assumed diving at 180 f.p.s. at an angle of 50° to the horizontal. The maximum load factor is reached only half a second after the stick is pulled back and before even a horizontal attitude is attained. The speed at this point has only fallen off 3 per cent. and the angle of incidence then remains high while the speed drops, due to the change of kinetic to potential energy and due to the drag of the machine.



Variation of angle of incidence and airspeed during a loop



Accelerations in different types of loop. The curves are, reading downwards, A, B, C, D and E

In practice, conditions are sometimes far from those as calculated.

In a particular test shown in Fig. 3, the angle of incidence does not remain anything like constant, in fact, when the aircraft is in the inverted position it actually becomes negative. The pilot probably pulled the stick back too rapidly, causing the stall to be passed; this resulted in excessive drag, shown by the rapid fall in speed from 95 to 25 m.p.h. in 5 seconds and in loss of centripetal force resulting in the aircraft falling out at the top of the loop shown by the negative incidence. No values for load factor were given in this test.

Fig. 4 shows accelerations in different types of loops. Fig. 4A is the record for a loop at which the speed at the start was 160 m.p.h. The stick was pulled back gently and the aeroplane allowed to climb to the top of the loop: the speed at the top was 60 m.p.h., increasing to 120 m.p.h. in recovery. Considerable altitude was gained during this loop. Fig. 4B the speed at the start was again 160 m.p.h., but the stick was pulled back more rapidly. Fig. 4C, the stick, was pulled back quickly and the machine allowed to fly itself over. The record shows that the recovery was poorly made. Fig. 4D is a slower loop, and Fig. 4E the slowest loop that the pilot was able to make.

These records show that the loads in this manœuvre depend on how abruptly the pilot pulls the stick back at any given speed. In recovering from the inverted position at the top of the loop, the pilot tends to allow the machine to dive farther than is necessary and then pulls out too quickly. The tendency to do this is even greater if the stall is reached, because the pilot is anxious to regain flying speed. Then he recovers as quickly as possible in order to avoid unnecessary loss of altitude. This, of course, imposes greater loads than are necessary.

(To be continued.)

SPINNING

By LIEUT.-COL. J. D. BLYTH, O.B.E., M.I.Ae.E.

(*Concluded from p. 77*)

Part II.—The Aeroplane in Free Flight

The path taken by a spinning aeroplane in free flight is influenced by forces of two kinds: those due to air loads, and those due to the mass of the machine.

It has been shown in Part I that a stalled aerofoil is prone to autorotation, since the variation of the forces along the span cause a couple to be set up; but no account has been taken of any translational movement.

The forces acting on the wing are shown diagrammatically in Fig. 8. It is obvious that the effect of such forces will be to cause the wing to rotate in the direction AB, and at the same time move bodily in the direction of the resultant R. As the wing rotates the direction of R also rotates with the result that the path of the wing is a circle. This movement causes a centrifugal force, *c.f.*, to act at G, the centre of gravity of the system, and, owing to the displacement of C from G, an additional couple is introduced which tends to rotate the wing further into such an attitude that the span DE becomes tangential to the circle. The effect of this is that during the incipient spin the wing describes a spiral of diminishing radius; and, if there were no couples tending to damp out the autorotation, the rate of spin would increase as described in Part I until the condition of stable spin was reached. The aerofoil would then be describing a circle, and the direction of the resultant R would pass through the point G and the centre of the circle, and R would be equal and opposite to the centrifugal force.

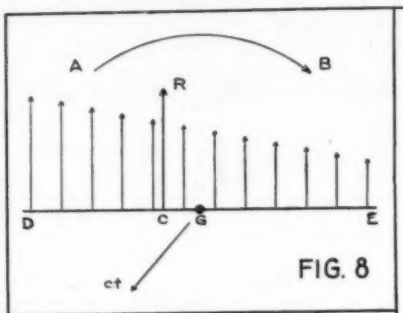


FIG. 8

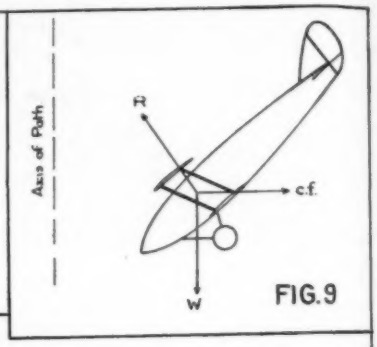


FIG. 9

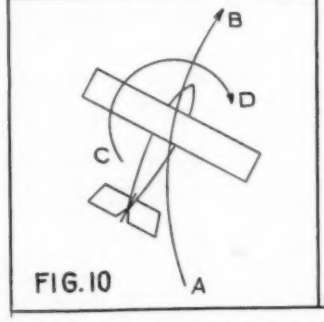


FIG. 10

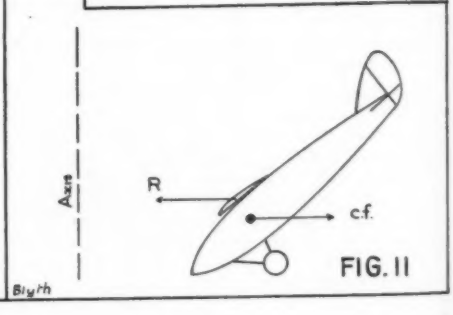


FIG. 11

It follows that in a stable spin an aeroplane is descending along a helical path whose radius is such that the horizontal component of the aerodynamic forces towards the axis of the helix is equal and opposite to the centrifugal force, while the rate of descent is such that the vertical component of the aerodynamic forces is equal to the weight of the machine (Fig. 9).

It has been shown in Part I that the angular velocity increases with incidence; and it is obvious that as the incidence increases the horizontal component of the aerodynamic forces diminishes, while the vertical component increases. The translational velocity, and therefore the centrifugal force are reduced in consequence, and the radius of the helix diminishes; while at the same time the rate of descent also is reduced. The extreme condition is that already described: when $\alpha = 90°$ the machine descends on a helical path of zero radius, *i.e.*: in a straight line; the angular velocity being high and the rate of descent low.

We will now consider the case of an aeroplane spinning to the right (*i.e.*, with the starboard wing descending), at some instant before the stable spin is reached.

It has been explained that the machine is travelling in a helix of decreasing radius; instantaneously the plan of its path may be represented by AB in Fig. 10. Reference to Fig. 8 will show that the couple set up by the resultant aerodynamic force and the centrifugal force will cause the machine to rotate in the direction CD, Fig. 10; the angular velocity of this rotation being greater than the angular velocity of the translational motion.

In Fig. 11 the horizontal component of the aerodynamic forces is shown, together with the centrifugal force. It will be seen that the couple set up will cause a moment tending to increase or decrease the incidence, *i.e.*, a stalling or pitching moment; and the magnitude of this moment will increase with an increase of incidence.

If the centre of gravity of the machine is below the point at which the resultant of the aerodynamic forces acts, as in the case of a parasol monoplane, the couple will tend to put the nose of the machine down; while if it is above that point, as in the case of a low-winged monoplane, the nose of the machine will tend to rise. In the case of a biplane the equivalent plane is usually situated fairly near to the centre of gravity, and the effect of the couple will be less pronounced.

It will be seen that if the centre of gravity is well forward, the arm of the couple is increased in the case of a high-winged monoplane, and so the pitching moment is increased. In the case of a low-winged monoplane the stalling moment is reduced, and may be converted into a small pitching moment in the early stages of the spin.

Owing to the fact that the machine is rotating about its own centre of gravity, a further set of centrifugal forces must be considered. These owe their existence to the fact that the mass of the machine is not concentrated at the centre of gravity, but is distributed all over it. For simplicity the whole mass has been taken to be made up of four masses m_1, m_2, m_3 and m_4, situated at distances l_1, l_2, l_3 and l_4 from the axis of rotation (Fig. 12).

If the angular velocity of rotation is Ω we have now a stalling moment of $(m_1 l_1 + m_2 l_2)\ \Omega^2 d_1$, and a pitching moment of $(m_3 l_3 + m_4 l_4)\ \Omega^2 d_2$. The resulting moment is given by the difference between these two, and since m_1 and m_2 are generally considerably greater than m_3 and m_4 there will be a tendency for the nose to rise and increase the angle of incidence.

As the incidence increases the distances l_1 and l_2 increase, and l_3 and l_4 diminish, while, as already explained, Ω increases. Consequently the inertia forces in a flat spin are considerably greater than when the angle of stall is moderate. Since d_1 decreases and d_2 increases with incidence, the stalling moment will reach its maximum before an incidence of 90° is reached, and gradually die away to that point; and when it is approaching its maximum, unless the wings definitely tend to damp out autorotation, the inertia couples may become so great that the controls are insufficient to overcome them. In such a case recovery

from the spin becomes impossible, and a parachute has much to be said in its favour.

In addition to the centrifugal couples, the effect of gyroscopic action must be taken into account.

As the nose of the machine rises, increasing the incidence, an angular velocity is impressed on the axis of rotation of the machine itself; and since the machine is rotating about this axis a gyroscopic couple is set up causing, in the case of right-hand spin, precession in a clockwise direction, *i.e.*, retarding the nose and advancing the tail in the direction of spin, and so increasing the rate of yaw. When the nose is being pushed down to reduce the incidence and recover from the spin the gyroscopic effects are reversed.

It is obvious that, except in the case of pure rolling, the axis of rotation of the airscrew will make an angle with the axis of rotation of the machine, and the axis of the airscrew

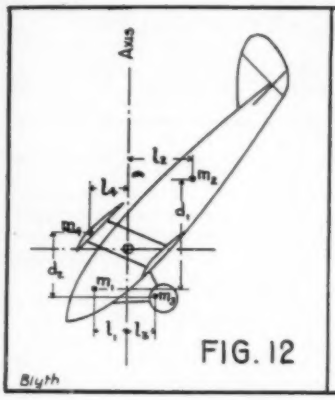


FIG. 12

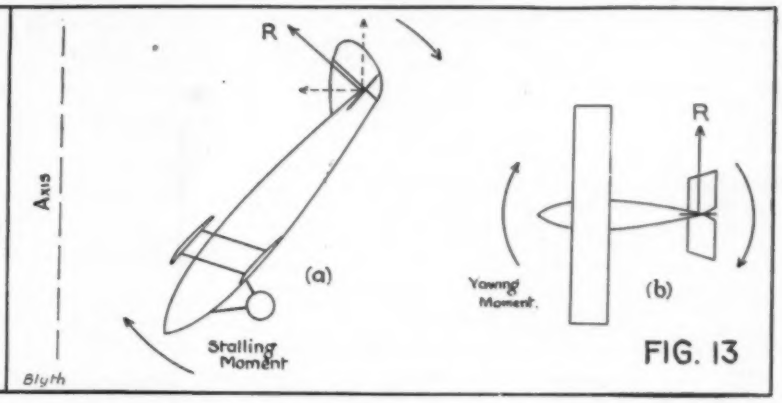


FIG. 13

will be subjected, therefore, to a continual angular velocity. If the airscrew is rotating in the same direction as the machine as viewed from the pilot's seat, *i.e.*, if the tip of the airscrew above the nose is moving in the direction of yaw of the nose, the gyroscopic couple due to the airscrew will tend to put the nose down, while if the nose is forced by any causes to rise, the airscrew couple will tend to increase the rate of yaw.

From this it will be seen that if the airscrew is rotating in the opposite direction to the machine there will be an added tendency for the machine to get into a flat spin, whilst during recovery there will be an increased yawing moment in the direction of the spin, making the manœuvre more difficult, while if the airscrew and machine are rotating in the same direction, gyroscopic couples are set up, reducing the flat spinning tendency and assisting recovery.

In "The Spinning of Aeroplanes" (Gates and Bryant) it is stated that in the case of the Bristol Fighter the airscrew inertia or gyroscopic couple is about one-sixth of that of the aeroplane with the power shut off, and about one-third at full power. This shows that if the airscrew is rotating in the opposite direction to the machine, opening the throttle will not assist in recovery from the spin, but will have the opposite effect as the gyroscopic couple tending to throw the nose of the machine up will be suddenly doubled.

Having considered the loads due to the mass of the machine, we have still the aerodynamic forces to examine. As already described, the wings are subject to forces which can be resolved into a horizontal force towards the axis of the helix or spiral, a component force vertically upwards and a couple causing rotation of the whole machine.

The body is subject to a moment about the centre of gravity, generally tending to increase the displacement from the flight path. The magnitude of the moment depends upon the shape of the body and the position of the centre of gravity, and owes its existence to the fact that until the angle of pitch or yaw reaches a fairly high value, the centre of pressure lies well forward, and in cases of small displacements may lie even in front of the nose.

The lateral force on the fin and rudder will produce a moment opposing the yawing component of the spin, while the stalling moment is opposed by the upward force on the tail plane and elevators. During the early part of the spin the tail plane and elevators produce a rolling moment opposing the rolling component of the spin unless they are themselves set at such an angle that they are stalled.

The anti-stalling and anti-yawing forces are shown in Fig. 13. They will have the greatest effect when they produce the greatest possible moments about the axis of rotation, therefore the areas of the appropriate surfaces and their distances from the axis should be as large as possible.

The actual areas will be fixed by other considerations, while the distance from the axis may be increased by increasing the length of the body and by setting the tail unit as low as possible.

The first method, that of increasing the length of the body, has the disadvantage of increasing the weight, and also of distributing the components of the weight along the fuselage to greater distances from the centre of gravity, thereby magnifying the centrifugal couples.

The question as to whether the fin and rudder or tail plane and elevator area should be increased requires consideration of the conditions applying as the spin varies in character. A simple method of visualising the direction of the wind on the tail unit is to imagine it set in the side of a rectangular solid, as in Fig. 14. In this diagram AG represents the fin and rudder, and GH the port half of the tail plane and

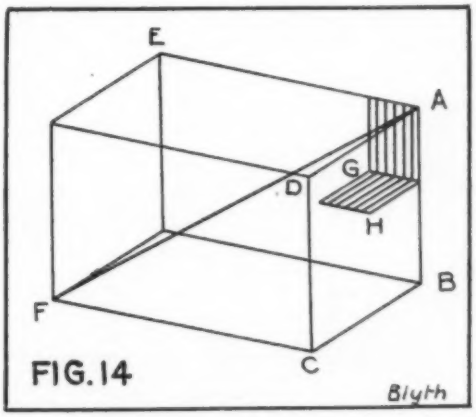


FIG. 14

elevator. AE represents the forward speed in the direction of the axis of the fuselage, AB the rate of vertical descent, and AD the lateral velocity due to yaw. Then the diagonal FA represents the speed of the wind meeting the tail unit, both in magnitude and direction. The diagram as drawn represents the conditions prevailing in a right-handed spin. It will be seen that as AE decreases, AD will increase and AB will decrease, but less rapidly than AE; until when AE

becomes zero AD and AB will have values corresponding to the condition of an extreme flat spin at 90° incidence.

During the early part of the spin, when AE is greatest and AD small, the fin and rudder may be blanked to some extent by the tail plane. Some advantage may be gained at this stage by increasing the area of the tail plane and elevators, particularly if this is done by increasing the span, as by doing so the anti-rolling moment of the tail plane will be increased. As the incidence increases the tail plane will stall and may contribute to the rolling moment, tending to increase the speed of auto-rotation. The rate of yaw also increases, and as it does so the effectiveness of the tail is steadily reduced, since the direction of the wind becomes more nearly parallel to its leading edge. For the same reason

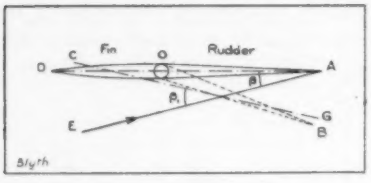


FIG. 15

the effect of the elevators will become progressively less, and the whole unit will behave more or less as a flat plate, the upward force due to BA tending to raise the elevators and push the control column towards the pilot. If the latter is permitted to take place the effective flat-plate area will be reduced, and there will be less anti-stalling moment. The effect is not likely to be very pronounced, as unless the elevators have a greater angular travel than is usual the reduction in the horizontal projection of their area will be mall.

As the angle of yaw, and consequently AD increase, the fin and rudder become more effective, as they are less shielded by the tail plane. The lateral force due to DA will produce an anti-yawing moment proportional to the fin and rudder area and to AD^2, which will have the effect of slowing down the rate of yaw, and will therefore reduce the tendency of the machine to get into a flat spin.

It appears, therefore, that the area of the fin and rudder is the most important factor in preventing the development of a vicious type of spin. It must be remembered, however, that if the area is increased the dihedral angle on the main planes must be increased also, in order to prevent spiral instability.

Fig. 15 shows the direction of the wind on the fin and rudder during yaw. If the rudder is put over from OA to OB the fin and rudder together form an aerofoil of comparatively inefficient section on account of the sudden break in curvature at O. The line of no lift is approximately CG, and the incidence from no lift is increased from β to β_1. It is obvious that unless the angle AOB is limited it is easy to get the section DOB into a stalled condition. This seems to suggest that better control might be obtained by eliminating the fixed fin area—at least as an adjunct to the rudder—and employing a balanced rudder instead, as it would be possible always to set such a rudder at the correct angle to produce the greatest possible force in the required direction.

The same line of reasoning applies to conventional hinged ailerons. Examination of the characteristic curves of an aerofoil will show that in the preliminary stages of the spin the rolling moment due to the ailerons may be reversed, since pulling the aileron down on the descending wing may increase the stall at that point and decrease the lift. In the stable spin the effect of the ailerons is not likely to be great, especially in the case of ailerons in the top wing of a biplane.

If the whole wing tip is made to pivot, as in the case of the Pterodactyl, it is possible to arrange the controls so that the tips are not stalled, whatever the incidence of the wings may be; and by making the area of the pivoting portion great enough, sufficient lateral control may be provided to overcome autorotation.

The interaction between the wings and tail must be considered, as this, in conjunction with the position of the centre of gravity, has an influence on the tendency of a machine to spin.

In the case of a biplane or high-winged monoplane in flight without yaw, the tail plane and elevators are in the down-wash from the main planes, and the tail unit is moving, therefore, in air which is descending relative to the flight path. The result is that the incidence of the tail plane relative to the air in which it is moving is less than its apparent incidence relative to the flight path. If the centre of gravity is in front of the centre of pressure on the wings, the tail plane will have to be set at a small negative incidence relative to the down-wash in order to provide the stalling moment necessary to balance the pitching moment caused by the weight of the machine acting in front of the resultant lift; but if the downwash is removed, the incidence of the tail increases and the down load on it is reduced and may become an up load, thereby increasing the pitching moment. This is what occurs when the angle of yaw is great enough to swing the tail out of the down-wash, and the nose of the machine consequently tends to fall and reduce the incidence.

In the case of a low-winged monoplane, the angle of down-wash at the tail will be small, or the tail plane may be even

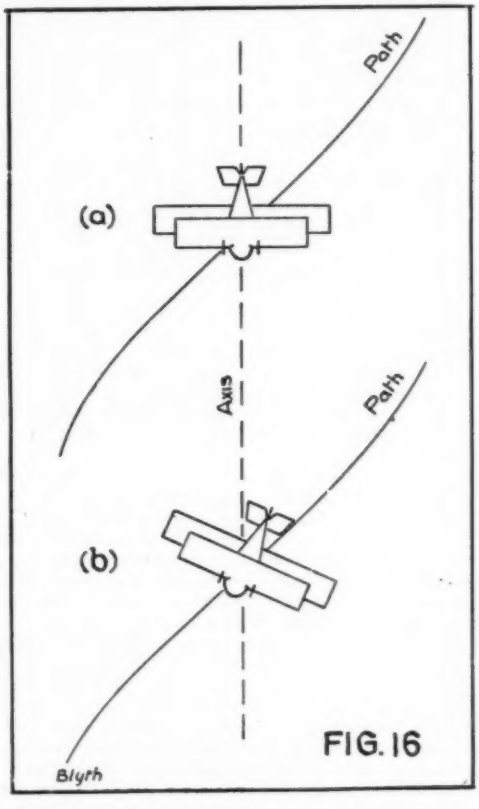


FIG. 16

out of the downwash. From this it may be deduced that a low-winged monoplane is more prone to spinning when stalled than a high-winged monoplane or biplane, though it will not develop the flat spinning tendencies of the latter once the spin has started.

Having considered the individual forces acting on the machine after autorotation has commenced, we can now summarise them and obtain some idea of the attitude a machine will adopt in the stable spin. We will take the forces and couples which oppose each other together, and will consider them as being resolved either horizontally and vertically, or parallel to and at right-angles to, the axis of the body.

These forces and couples are :—

1. A rolling moment due to the autorotational couple on the wings, together with a rolling moment due to the air

loads on the tail, which may assist or oppose that due to the wings.

2. A yawing moment due to the autorotational couple on the wings, probably slightly assisted by the yawing moment on the body, and opposed by the yawing moment due to the side load on the fin and rudder.

3. A resultant lift towards the axis of the path, and a centrifugal force away from it.

4. A centrifugal couple tending to raise the nose, opposed by the pitching moment due to the upward force on the tailplane and elevators; and a couple formed by the lift towards the axis of the path and the centrifugal force, which may tend to either raise or depress the nose.

5. A gyroscopic couple due to the air screw and, until the spin becomes stable without acceleration, a gyroscopic couple due to the angular movement of the axis of the rotating machine.

6. The weight of the machine vertically downwards, and the resultant of the various drag forces vertically upwards.

7. A couple formed by the weight of the machine and the resultant of the aerodynamic forces.

Since the machine will attain an unaccelerated rate of spin when all the forces and couples balance each other, it will be seen that the value of $\tan^{-1}\frac{x\,\Omega}{V}$ will not be the same for the complete machine as for the wings alone; for when the machine reaches a state of stable autoratation there must be a residual couple provided by the wings to balance the anti-rotational couple due to the forces on the fin and rudder and any other damping surfaces.

Similarly, the resultant lift probably will not act exactly on the line through the axis of the path, but will form a couple with the centrifugal force balancing any couples tending to throw the machine out of its final attitude.

From these considerations it appears that the machine will descend in a helical path with its nose pointing inwards, but not directly towards the axis of the helix; so that the span of the wings will not be parallel to the tangent to the plan of the helix, but will make a small angle with it.

If the span were parallel to the tangent to the helix itself, the movement would entail considerable sideslip. This would cause a rolling moment on account either of the dihedral angle, or of the fin area, or of both; with the result that the machine would take up a banked attitude with respect to the helical path. Fig. 16 (a) shows a machine descending with sideslip, causing the attitude finally assumed to be that shown in Fig. 16 (b).

It will be remarked that there are a number of forces and couples to be balanced; several of which are dependent for their size on the magnitude of the others. Consequently the accelerations produced will be such that the condition of stable autorotation may be overshot, and the machine will "hunt" or oscillate about the stable attitude. It is questionable whether in practice a machine can be permitted to spin for long enough for such oscillations to be damped out. This may be the explanation of why accelerometer records of a spin always show oscillations.

On the other hand, it is possible that such oscillations are caused by external aerodynamic forces due to movements in the air; as though theoretical conditions are taken to apply to still air, such conditions seldom, if ever, exist.

The conclusions to be drawn from an examination of the conditions during a spin are that, though autorotation of the wings when stalled is the basic cause of spinning, there are a number of other factors dependent on the characteristics of the machine itself which may cause the spin to become of a vicious type, or even may make spinning impossible. For example, it is not to be supposed that every biplane is likely to get into a flat spin, although the wing characteristics would seem to indicate this. The old box kite type of biplane seems to have been immune from any tendency to spin; the explanation probably being that the weight was concentrated in the centre of the machine, since the pilot sat on the leading edge of the bottom plane with the engine just behind him; the structure weight of the tail booms, etc., being very low. Further, the top speed was generally little, if any, higher than the stalling speed of most modern machines, with the result that the couples producing autorotation and also the centrifugal couples would be small and easily overcome.

Probably the wing characteristics have the greatest effect on the initial tendency to spin; but the final rate of spin will be influenced principally by a combination of wing characteristics, distribution of weight along the fuselage, and fin and rudder area. Since thin wing sections of low camber ratio generally will spin faster than thick sections of high camber ratio, the centrifugal couple will be greater in the case of the thin section: and it may be deduced that the type of machine which is most likely to develop a vicious variety of spin is a thin-winged biplane of low aspect ratio, with negative stagger and small gap: especially when combined with wide distribution of the weight along the axis of the fuselage, e.g. behind the centre of pressure of the wings, a high position of the tail unit, and inadequate fin and rudder area. At the other end of the scale is the high-winged monoplane with a thick aerofoil section, low position of tail unit, and ample fin and rudder area. Since a monoplane wing has no inherent flat-spinning tendencies, the distribution of weight is less important, though it is still desirable to keep it concentrated as much as is possible.

In conclusion, it may be added that the deductions made in the foregoing article are put forward as suggestions only. Having been arrived at from theoretical considerations alone they should not be regarded as incontrovertible facts, though many of them are in agreement with practical experience.

AN ANALYTICAL REVIEW OF THE AERO ENGINE EXHIBITS AT OLYMPIA.

By N. E. Kearley, A.M.I.E.E., A.M.I.A.E.

(*Continued from page* 80)

The crankshafts of the in-line engines are all of the one-piece type carried in plain white-metalled bearings throughout, with the exception of the Cirrus, which has a roller bearing at each end, the intermediate bearings being of the plain type. White-metal bushed split big-ends are employed without exception on the in-line engines. Duralumin or aluminium alloy connecting rods are fitted in the Renault and Cirrus Mark III engines. The pairs of connecting rods fitted in the Isotta-Fraschini type engine are of the master rod and articulated rod type. The crankshafts of the three horizontal opposed engines are all of the integral type carried by roller bearings, a plain centre bearing being fitted in the case of the A.B.C. four-cylinder Hornet. The A.B.C. engines also have a novel form of floating bush type big-end bearing, the bushes being halved to permit assembly; they are joined *in situ* by steel bolts.

Reduction Gears:—Although only 15 per cent. of the air-cooled engines under review are of the geared type (as compared with 67 per cent. of the water-cooled engines) among these few three different forms of reduction gear are represented. Epicyclic gears, either of the bevel or spur wheel type, are used on all the geared air-cooled engines excepting the Pobjoy, which has an ordinary form of gear, but is unusual in having gear wheels of the herringbone or double helical type. The epicyclic gears are convenient and compact as the airscrew shaft remains co-axial with the crankshaft. The axial length of the bevel variety compares unfavourably with that of the spur type, but for a given diameter it is possible to obtain a larger reduction with the bevel type, so there is little to choose between the two forms. But for the fitting of a spur type epicyclic gear to the tiny horizontal opposed 20 h.p. Mercedes-Benz engine, the honours would have been evenly divided, there being two representatives of each type employed in the radial engines.

The ordinary type of gear, as illustrated by the Pobjoy, may be made extremely compact, and, furthermore, a large reduction has been obtained without introducing a gear case of awkward dimensions; in fact, at first sight it would appear from the shape of the gear case as though the airscrew shaft were geared up instead of the reverse, this being, of course, due to the housing of a light flywheel within the pinion housing of the gear case. The fitting of a flywheel to steady

the crankshaft torque, and thus prevent chattering of the gear teeth, is a further unique feature of this interesting little engine. In the case of a small engine an incidental point in favour of employing the ordinary form of reduction, with higher airscrew position (unless it interferes with cooling) is that either the ground clearance is increased or a larger diameter airscrew may be used. All the in-line engines under review are of the direct-drive type.

It would appear opportune before leaving the subject of reduction gears to remark that the time seems overdue when aero engine manufacturers and users agreed among themselves as to the manner of stating gear ratios. It has been the usually accepted practice to take the revolutions of the driven shaft as unity, and to express the revolutions of the driving shaft as so many times greater, presumably because the greater interest generally attaches to the speed of the primary, as, for instance, when stating that a car has a top gear ratio of 4 : 1, one is more interested in knowing the engine speed in relation to that of the back axle than *vice versa*, although the back-axle gear is a reduction gear in the same sense as that driving the airscrew shaft. In the case of a geared aero engine, however, the interest lies in knowing at a glance the airscrew or driven shaft speed in relation to the engine speed. This may seem rather a small issue to raise, but it is a fact that, owing to the lack of uniformity in expressing the ratio, a certain amount of confusion exists. For instance, quite frequently discussions arise as to whether the usual form of Farman bevel epicyclic gear provides a ratio of 2 : 1 or 0·5 : 1. Whichever system is adopted, it should be rigidly adhered to. A glaring example of the confusion in methods was provided by the descriptive literature issued by a very famous water-cooled engine manufacturer; both systems were used, one with reference to one engine, and the other for another engine of similar general design, but having a slightly different ratio and arrangement of gearing.

Ignition.—All the British air-cooled engines under review are fitted with magnetos but two foreign engines, the Farman and Fuscaldo radials have battery-and-coil ignition. The two H.T. distributors of the Farman are located transversely above the reduction gear casing, but those of the Fuscaldo are mounted at the rear of the crankcase. Single magnetos are employed only on four of the smallest engines, the horizontally opposed Scorpion, Hornet, and Mercedes-Benz 20 h.p. and also on the small Salmson, the 40 h.p. nine-cylinder radial. In the case of the two foreign engines only one plug per cylinder is provided. The single magnetos of the A.B.C. engines each supply two plugs per cylinder. The ignition arrangements of the Pobjoy are interesting in that two single point magnetos, each having seven terminal distributors, are employed, a scheme that should greatly facilitate starting owing to the comparatively high armature speed. The Salmson engines are unique in having magnetos made by the engine manufacturer.

Miscellaneous :—Among the few remaining items of interest with regard to the air-cooled engines, perhaps the arrangement of the auxiliary drives affords the most useful comparison. The tendency in the case of the radial engines is to place all the auxiliaries at the rear of the crankcase. Regarding the location of the magnetos, there were only four radial engines in the show having the magnetos mounted at the front of the crankcase, two British (Mongoose and Genet) and two foreign (Renault and the Walter "Castor"). The practice among British radial engine builders is to place the magnetos transversely whether at the front or rear of the crankcase, but this arrangement is the exception rather than the rule in the case of the foreign radials. In the in-line engines the magnetos are located transversely at the rear of the engine, excepting the Argus and Cirrus. In a number of engines one or more mechanical fuel pumps and also the gun gear are fitted at the rear of the crankcase. Oil pumps and filters are in most cases accessibly mounted. Electric starting motors are fitted to the Farman and Fuscaldo radials, in addition to the generator for the ignition system. The general arrangement of the auxiliary drives of the latter engine are unusual in that seven separate short camshafts are employed, one at the side of each cylinder, and the rear end of each of these drives an auxiliary. Provision is made for driving the aircraft lighting generator at the rear of the Walter "Castor" crankcase.

Superchargers were very poorly represented among the air-cooled engines, there being only one British example, a sectioned model of the Jaguar, and one foreign, the Fuscaldo. Both of these superchargers are of the gear-driven centrifugal rotor type situated between the carburettor and engine. The carburettor and induction arrangements afford little material for comparison; the placing of the carburettors of the Airsix, one at each end of the straight, unbranched, induction pipe is unusual. Jacketing the induction pipe either by exhaust gas or warm oil is much in evidence, though some of the smaller engines employed a "hot-spot" system. In concluding this portion of the article, devoted to the air-cooled engines at the Show, it should be remarked that a uniformly high degree of workmanship and finish was apparent on the British and foreign engines alike. The next instalment will deal with the design features and characteristics of the 27 water-cooled engines.

(To be continued.)

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C. 2; 28, Abingdon Street, London, S.W.1; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; or 120, George Street, Edinburgh; or through any bookseller.

THE EFFECTIVE TORSIONAL RIGIDITY OF A CRANK.—By R. V. Southwell, F.R.S. R. & M. No. 1211. (E. 30.) (17 pages and 12 diagrams.) July, 1927. Price 9*d.* net.

The calculations in the paper are based upon the theory of thin rods, and the properties of the equivalent bar are no longer assumed *ab initio*, as by other writers, but are left to be determined by experiment. Formulæ are found for the effect of a simple twisting action on the effective stiffness of a single-throw crank encastré at the journals.

This work has been applied elsewhere in connection with experiments carried out at Cambridge on the torsional stiffness of crankshafts (see R. & M. 1201).*

* R. & M. 1201. Report on the stiffness of crankshafts.—H. Constant, B.A.

ON THE MAXIMUM LOAD IN PULLING OUT FROM VERTICAL DIVES.—By S. B. Gates, M.A., and H. B. Howard, B.A., B.Sc. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1232 (Ae. 387). (9 pages and 2 diagrams) November, 1928. Price 9*d.* net.

The main object of the present investigation was to ascertain whether it was possible that loads sufficiently heavy to produce structural failure could be thrown on the wings of an aircraft when the pilot releases the control column in a steep dive.

It has been found that with certain simplifying assumptions the equations of motion for recovery from a vertical dive can be integrated directly. A formula has been deduced by which the maximum load on the wings resulting from a given change in force on the control column in a vertical dive can be calculated with reasonable accuracy on aircraft that are not longitudinally unstable.

It is calculated that conditions under which structural failure will follow release of the control column are likely to arise on the smaller types of aircraft. Certain general conclusions regarding the variation of load under different conditions are reached.

ON THE STABILITY OF CONTROLLED MOTION. By W. L. Cowley, A.R.C.Sc., D.I.C. R. & M. No. 1235. (Ae. 390.) (9 pages and 3 diagrams.) December, 1928. Price 9*d.* net.

In collaboration with Professor Levy, and whilst he was a member of the staff of the National Physical Laboratory, the present author investigated the stability of an aeroplane when its controls were moved according to definite laws governed by the departure of the machine from the steady flight condition. Unfortunately, that work was interrupted through Professor Levy leaving the laboratory staff and the call of more urgent work retarded further progress. This note is the outcome of an investigation by the present author, and although it is based upon conclusions drawn from the work mentioned, the substance of that work is not discussed in detail, because the conclusions arrived at in that work are now generally accepted. The object of this report is to present a simple method for studying the stability of a controlled aeroplane and to discuss in detail the effect upon stability of lag in the application of the controls.

AIR TRANSPORT

THE DISTRIBUTION OF CIVIL AIRCRAFT

THE accompanying chart, for which we are indebted to the Aviation Department of the Automobile Association, is of particular interest to followers of Air Transport in that it shows graphically the approximate distribution of civil aircraft, of the various branches, registered in this country in October last.

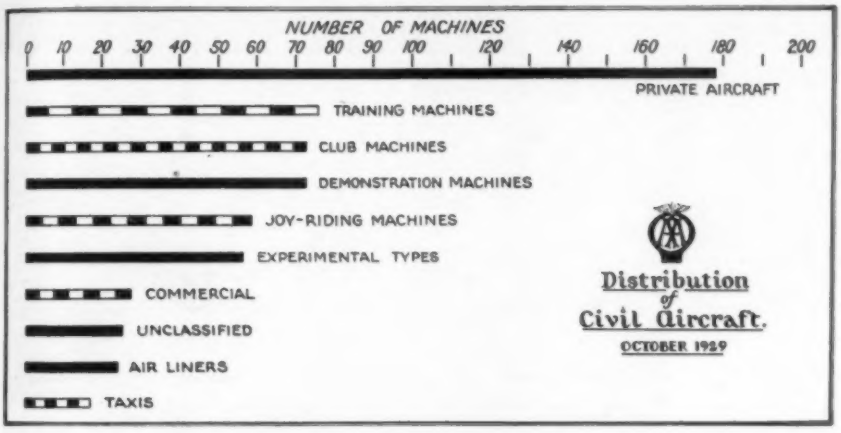
It should be noted that the figures are not absolutely accurate owing to rapid increase in numbers, and change of ownership, which is taking place—one might almost say day by day. This is especially the case as regards "Private" aircraft, for new private owners are coming along pretty fast now.

Further difficulty in preparing this chart was experienced in the classification of certain machines, which are used alternatively for joy-riding, training and taxi work.

The figures for experimental machines contain a fair proportion of aircraft built for fighting purposes. Such machines, usually built by private enterprise, although not strictly civil aircraft, have been registered as such and are therefore included. This strip also contains many new civil types which have not yet reached the production stage.

The strip for commercial machines refers to aircraft used for specialised purposes, such as air survey, photography and sky-writing. Machines used by firms for the conducting of their business are also included. "Air Liners" consists solely of machines operated by Imperial Airways, Ltd. There being no other regular British Air Line operating at present, all other passenger-carrying aircraft are classed as taxis.

Finally, the unclassified strip is made up of machines whose present existence as airworthy units is doubtful, although they are still registered as such.



The divisions in some of the strips show the number of Companies or Clubs operating the class of aircraft concerned

Canada's Air Mail Services

A NEW link will be forged in the chain of aerial mail services binding Canada's great expanses closer together when the McMurray-Aklavik service is placed in operation in November by the Hon. P. J. Veniot, Postmaster-General. Within the last few weeks final arrangements for the inauguration of this all-the-year-round service were completed at Ottawa and the first mail was scheduled to leave Edmonton on November 26. The mail is carried by train to McMurray where the sacks are loaded on a Commercial Airways machine for the twelve points of call between there and the end of the 2,000-mile route at Aklavik in the mouth of the Mackenzie river. For the winter months a weekly service will be provided to residents at Chipewyan, Fitzgerald, Fort Smith and Resolution, in all twenty return trips being made to these points during the coming winter. Hay River, Providence, and Simpson will receive mail from the south approximately once a month, while the more northerly posts at Wrigley, Norman, Good Hope, Arctic Red River, McPherson and Aklavik will be served by three winter mail deliveries from Edmonton. The mails for the farthest north posts close at Edmonton on November 26, January 21, and March 25, and the return mails from these points will arrive in the Albertan capital on December 13, February 7 and April 11. The new service will be an immense advance on the winter service provided in other years and will confer an inestimable benefit on the residents of the posts along the Athabaska, Slave and Mackenzie rivers. Incidentally, it will constitute the farthest north regular air mail service in the world. Heretofore the winter service to Aklavik consisted of two dog trains restricted to 250 lbs. of first-class mail per train. The frequency of mails during the summer months will, of course, be much greater, about double that outlined above. This notable extension of Canada's air mail service will bring a remote but important region of the Dominion's vast northland in closer touch with the outside world both socially and commercially. The following rates of postage have been fixed by the Post Office Department for mail matter to be conveyed over this air mail route :—

First-class matter, *i.e.*, genuine correspondence in the regular and ordinary form of a letter, two cents per ounce or fraction thereof. (Parcels prepaid at letter rate will not be accepted.) Second-class matter, *i.e.*, newspapers and periodicals, one cent per four ounces. Third-class matter, *i.e.*, printed matter, samples, etc., two cents per ounce or fraction thereof. Parcels Post (Merchandise) rates for a pound or fraction thereof : To Chipewyan, Fitzgerald, Fort Smith, Resolution, Hay River and Providence, 50 cents ; to Simpson, Wrigley, Norman and Good Hope, 75 cents ; and to Arctic Red River, McPherson and Aklavik, 1 dollar. Registration, insurance, etc., are additional to the above.

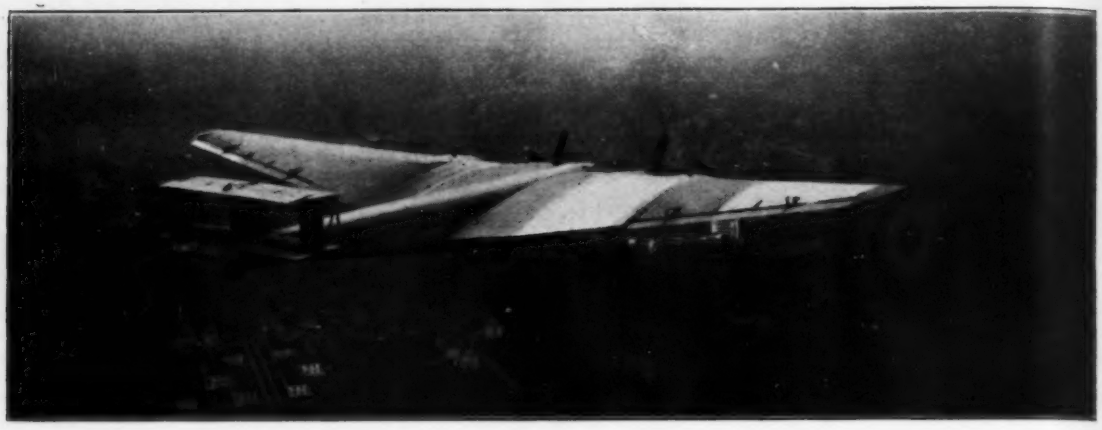
A London-Hull Air Service ?

IT is reported that plans are being discussed, between the Hull Incorporated Chamber of Commerce and Shipping and National Flying Services, regarding an aerial service for passengers and freight between Hanworth and Hull.

An Air-and-Rail Freight Service

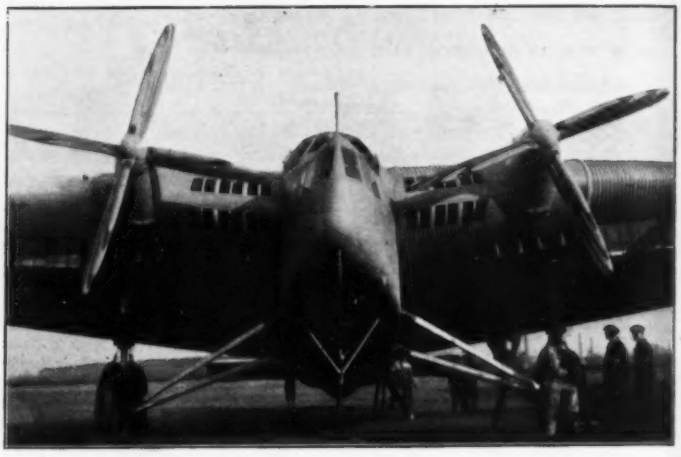
NEGOTIATIONS have been concluded, it is reported, between Imperial Airways and the railway companies for a combined rail and air goods service, which will enable goods to be sent from over 100 provincial towns by train to London to connect with Handley Page-Napier air freighters to the Continent at through rates.

THE JUNKERS G. 38.



REFERENCE has previously been made to the new large monoplane recently launched by the Junkers Works of Dessau, Germany. A photograph of the wind tunnel scale model was published in FLIGHT of February 7, 1929, and a photograph of the actual machine in our issue of November 15, 1929. We have now received from the Junkers Works the accompanying photographs of the G.38, as well as a few data relating to the machine.

Of all-metal construction, mainly of Duralumin, the G.38 is of the type which the Germans term "Shoulder decker," from the fact that the wing is attached near the top longerons. Passenger accommodation is partly in the fuselage and partly in the inner wing roots. The main dimensions and weights are as follows: Length, overall, 23 m. (75 ft. 5 in.). Wing span, 45 m. (147 ft. 6 in.). Tare weight, 13 m. tons (28,600 lbs.). Gross weight, 20 to 24 m. tons (44,000 to 52,800 lbs.). Range with 9,840 lbs. useful load 2,170 miles. The power plant consists of four Junkers engines, developing a total of 2,400 h.p.



TO HELP CROSS-CHANNEL AIRCRAFT

WHAT is claimed to be the world's fastest lifeboat, built for the Royal National Lifeboat Institution, was launched on the Thames on Thursday, the 21st inst., by the Hon. Mrs. Forbes-Sempill, daughter of Sir John Lavery and wife of Colonel the Master of Sempill.

The new boat, which will be the largest as well as the fastest of the Institution's lifeboats, has been designed in collaboration with Mr. J. R. Barnett, O.B.E., M.I.N.A., the Institution's Naval Architect, and built by Thornycrofts, and is the first lifeboat to be built with the special idea of going to the help of aeroplanes which come down at sea. She will be stationed at Dover where, in addition to the very heavy passenger-steamer traffic across the Straits, there is now a considerable daily traffic by aeroplane, maintained in all but the worst weather.

The new vessel is a distinct development in this class of construction and embodies many interesting features. Of 64 ft. in length and 14 ft. beam, she has eight main water-tight compartments and eighty air cases. Like the Barnett type of motor lifeboat, there are two cabins with accommodation for some 50 persons. Electric lighting is provided throughout and there is an electrically-driven capstan, searchlight and line-throwing gun. In addition, the boat will be fitted with wireless telephony, enabling messages to be taken and sent over a distance of 50 miles.

There is also a wave subduing apparatus which consists of an oil tank, from which the oil is fed through outlet pipes on either bow just above the waterline.

As regards the propelling machinery, the most powerful lifeboats at present in service have two 80-h.p. engines. The new vessel has engines totalling 750 h.p. of the 12-cylinder type, as installed on the world-famous Thornycroft Coastal Motor (Torpedo) Boats. With this machinery the boat will have a speed of 17 knots.

The design of the vessel has called for all the resources and ingenuity on the part of the builders in order to arrive at a satisfactory combination of sea-worthiness and high speed. Their long and progressive association, however, with this form of boat construction, has put the firm in a very advantageous position to contend with modern requirements, and in recent years they have supplied many successful motor-propelled boats to the leading British and foreign steamship lines.

Our illustrations show the lifeboat being launched from Messrs. Thornycroft's yard at Hampton-on-Thames, and, below, off for a short cruise.

British Air Service Changes

WE have received an announcement to the effect that Mr. G. W. Higgs, Marine Airport, Southampton, has acquired the aviation department of the Tour and Travel Association, Ltd. Pending important changes the Channel Islands and other air services are suspended. The policy of the new company and its air routes will be announced in due course. Aircraft, including flying boats and amphibians, are now available for private charter.

The Cape-to-Cairo Air Route

WORK on planning out the southern section of the Cape-to-Cairo air route is now in progress; this is being carried out by a joint party of officials representing the Air Ministry, Imperial Airways, and the Cobham-Blackburn Air-lines, who are employing ordinary ground methods of transport as far as Northern Rhodesia. Sir Alan Cobham will shortly fly out to meet the party there in the D.H.61 *Youth of Britain*, which has been purchased by Imperial Airways for use in connection with the surveying of the route. On arriving in Northern Rhodesia Sir Alan will hand the machine over to Mr. Wolley Dod, who, accompanied by Capt. Tymms (Air Ministry) and Capt. Gladstone (Cobham-Blackburn Air Lines), will fly back to Cairo and complete the ground organisation of the northern section of the route.

Pan-American Airways

THE Pan-American Airways, together with the associated company, the Pan-American Grace Airways, have announced, says the *Times* New York correspondent, a large extension of their passenger services in Central and South America, which within five or six weeks will make this airways system the largest in America. The number of daily long-distance runs to points south of Miami (Florida) will be doubled. Sixty air liners will be used in daily services to the West Indies, the Canal zone and Dutch Guiana. The machines on the Miami-Havana line will be capable of carrying altogether 70 passengers each way daily. On December 31 a passenger service will be opened between Miami and Cristobal (Colon) in the Canal Zone which will connect with the Pan-American Grace Airways' new passenger service from Cristobal *via* the west coast of South America, across the Andes to Buenos Aires. This will reduce the time of the journey between New York and Buenos Aires to 12½ days—a gain of more than nine days over the steamship route. The company has built its own hotels for the accommodation of its passengers at the smaller places on the route.

Another Ambitious American Air Scheme

IT is announced by the General Development Co., of Connecticut, U.S.A., that they propose to construct four "world's largest airliners" for the transport of passengers and express matter over scheduled air routes. These machines, which, it is hoped, will be completed by the end of next year, will have a span of 262 ft., an overall length of 138 ft., and a height of 31 ft. They will be of the "in-the-wing" type, and designed to carry 160 passengers and a crew of 17, although their maximum accommodation will be 260. Each will be equipped with eight 1,000-h.p. engines, arranged in two units of four. Sleeping cabins for 180 persons, dining rooms seating 42, spacious lounges, electrically equipped kitchen, buffet service, lifts, &c., comprise some of the features promised. It is not stated, however, if passengers will be allowed to fly their own light 'planes during flight.

Stuttgart Aerodrome to Close Down

As a protest against the failure to withdraw overhead electric cables, carrying 220,000 volts, in the vicinity of Stuttgart aerodrome, it has been decided to close down the aerodrome at the end of six months.

AERO WHEEL-BRAKES

Lecture by Mr. HALL

ON Friday, November 8, Mr. Hall, of Bendix-Perrot Brakes, Ltd., Birmingham, lectured before the Westland Aircraft Society.

In the absence of the chairman, Mr. R. A. Bruce, Managing Director of Westland Aircraft Works, Mr. Hall was introduced by the acting chairman, Capt. G. T. R. Hill.

About 70 members were present. The lecture was accompanied by lantern slides illustrating the Bendix-Perrot wheel brake and its component parts.

The lecturer began by making a few general remarks on the situation with regard to aircraft brakes, and explained how the trade was only just emerging from the stage when aero wheel brakes were merely adapted forms of automobile wheel brakes, and that the aeroplane industry, from the point of view of wheel brakes, is now in about the same stage as the motor industry was with car brakes six years ago. In this respect, the United States are very far ahead of us.

The aircraft industry is now realising, however, that the brake needs of an aeroplane have to be specially catered for, and it is to this end that Messrs. Bendix-Perrot, in particular, are making research, having abandoned the ordinary motor-car two-shoe brake as inefficient.

The lecturer stated that the average reduction in the landing run of machines fitted with the modern Bendix-Perrot brake was 50 per cent., and that the fitting of brakes has the effect of assisting the ground crew. Furthermore, it permits the use of a tail wheel, instead of a skid, thereby improving the surface of aerodromes and eliminating wear and vibration of the empennages to a very large extent.

Servo control has been found to be necessary, and in combination with this, the ideals aimed at by the brake industry are safety and simplicity. In this instance, the type of brake is the self-energising Servo system, which gives full action under slight pedal pressure. In this type of brake, the primary shoe has no fixed anchor, but hinges on the floating end of a secondary shoe. In this respect, the action of the primary shoe in engaging with the drum tends to hold it in position, and through the floating hinge, the primary shoe energises the secondary.

Mr. Hall impressed on his audience that Messrs. Bendix-Perrot Brakes, Ltd., while not opposing or eliminating other methods of applying braking power, advocate the rod control throughout.

The lecturer, however, did not venture on the other systems of braking, such as hydraulic, etc., but merely remarked that Messrs. Bendix-Perrot had quite an open mind on the subject, and were still experimenting along these lines.

Various slides were then projected on the screen, and the lecturer indicated how the best position of the cam spindle is just vertically above the axle, though it can, indeed, be placed anywhere on the periphery, according to the type of plane to which it is fitted. This vertical position is best, however, as it is farthest from the ground and, therefore, the operating lever is clear of ground obstruction and is therefore not likely to suffer damage.

Furthermore, when wear takes place, the vertical position of the cam permits of adjustment being made to allow for such wear on the axle.

The whole of the brake backing plate and drum is press work, or bar work, and the use of electron is now being considered.

The standard sizes of brakes at present in use are the 10 in., 12 in., and 20 in. Larger sizes are contemplated. The clearance for a 12-in. brake is about 15/1,000th, and the construction of the brake is all steel, which is later cadmium plated.

Mr. Hall laid it down, as a strict rule, that whenever relining brake shoes was necessary, they should be sent back to the Bendix-Perrot factory, where they would be exchanged for new shoes. This course was preferred, as in certain cases where shoes had been relined locally, the results had been poor.

The following questions were paramount in discussing the consideration of the problem of aircraft brakes :—

(1) The design of the undercarriage, and the question of how the torque is to be transmitted to the fuselage.

(2) The fore and aft position of the wheels and their brakes (the farther forward the brakes and wheels are located, the more torque is transmitted—but more load is placed on the tail in such case).

The torque load formula is one-half weight of machine on one wheel by effective tyre radius, by co-efficient of friction of tyre on the ground, by the factor of safety of a shock landing.

(3) A wide wheel tread is desirable. Bendix-Perrot work to a deflection of a quarter of the diameter of the tyre, and they take the co-efficient of friction in excess of 0·8 on clean concrete with the tyre on the ground.

With regard to deceleration, a comfortable retardation for cars is at the rate of 22 ft. per second squared. With aeroplanes, however, the deceleration of 14 to 16 ft. per sec. squared is what is being striven for. At the moment, brakes giving good retardation give about 8 to 10 ft. per second squared.

Of course, in this consideration it should be remembered that concrete aerodromes will probably become standard in course of time.

Other points of interest in the lecture were :—

(1) Brake effectiveness remains constant below 30 m.p.h.; after that, the wings commence to take up the lift.

(2) The accuracy needed for the axle is plus or minus 1/1,000th.

(3) Hook-up control. For single-engined machines, a separate control is needed for each wheel, or they may be differentially operated, and there should be only a 7-deg. movement of the control lever from the position *off* to the position *on*, if all is in order.

Messrs. Bendix-Perrot prefer rod control with bell cranks to other methods.

With regard to pedal-operated brake gear, a parallel motion linkage is necessary. In this the stirrup type is the best, and this type is largely used in America, though, at the present moment, Great Britain seems to prefer the rudder-bar control. It was found that hand-operated brakes are not quick enough in operation.

The matter was then thrown open for discussion and the lecturer was asked for his definition of the American term "ground loop," which he employed several times. Mr. Hall replied that, in his opinion, a ground loop was a term used for the motion of the machine when one brake only is applied strongly or a tyre burst is experienced on one wheel, whereby the machine turns rapidly round on its own axis, instead of maintaining a straight taxi-ing run.

The general impression of his audience, however, appears still to be that a "ground loop" indicates a machine, owing to brake seizure or tyre burst, going on to its nose, and from thence to its back while taxi-ing.

Capt. Hill then thanked the lecturer for his remarks, and the session terminated.

Appointment to the Higher Command, R.A.F.

THE Air Ministry announces that the following appointment will take effect from December 16, 1929 :—

Air Commodore Arthur Murray Longmore, C.B., D.S.O., to be Air Officer Commanding, Royal Air Force, Cranwell, and Commandant of the Royal Air Force College, in succession to Air Vice-Marshal Frederick Crosby Halahan, C.M.G., C.B.E., D.S.O., M.V.O., on the latter completing his three years' appointment.

No. 8 Seaplane Squadron Reunion

OLD members of No. 8 Seaplane Squadron will be glad to see old friends at the East African Campaign dinner on December 2, tickets for which are obtainable from the secretary, 20, St. Thomas's Mansions, Lambeth, S.E.

The Esher Trophy: Air-Marshal Sir Hugh Trenchard presenting the Esher Trophy (given by Lord Esher for the best all-round Auxiliary Air Force Squadron) to Sq./Ldr. J. Fullerton, 602 City of Glasgow (Bomber) Squadron, A.A.F., in the City Chambers, Glasgow. From left to right are Sir Davis Hason, Gp. Capt. Macneece-Foster, Sq./Ldr. J. Fullerton, Sir Hugh Trenchard, Lord Prevost Kelly, and Capt. Menzies.

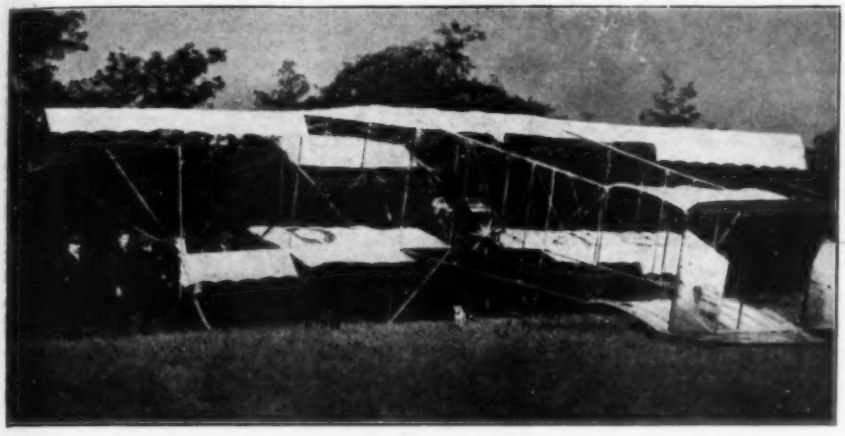
CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

A LINK WITH THE PAST

[2222] When I was turning out some drawers the other day the enclosed photo came to light. Perhaps it may be of interest to you.

One fine July morning in 1911, and about 7 a.m., some of us, students, who were on the top floor of the Agricultural College at Uckfield, Sussex, were surprised to hear, what was then, the unaccustomed noise of two rotary motors. Looking



out of a window we saw two biplanes, one of which is the subject of the photograph. This one promptly did a forced landing in a field nearby. Its pilot and passengers sitting "pick-a-back" were Messrs. Pizey and Fleming. The accompanying machine, a Bristol of the same type, and piloted solo by Mr. Gordon England, whose flying kit consisted of a cap reversed and an ordinary lounge suit with layers of newspaper under the waistcoat (!) did a perfect landing on Uckfield recreation ground at rear of college. Our principal invited the airmen to have breakfast at the college, which they did, and later in the day we had the pleasure of repairing parts of the damaged left wing in the carpenter's shop. This repair was apparently sufficiently airworthy to allow of the machine being flown away the next morning.

A. BERTOLACCI,
late R.A.F.

Worthing.
November 18, 1929.

AVIATION OLD-TIMERS

[2223] As an old member of the Royal Aero Club and one who continues to take the keenest interest weekly in the arrival of FLIGHT at my Riviera home, I always enjoy thoroughly the many fine special numbers you issue from time to time.

It occurs to me that many of us would welcome what I suggest might be termed "The Old-Timer's Number." I often wonder what has become of some of those famous pioneers of pre-war days, whose names and photos were so constantly in your pages in those distant ages. Too many, unfortunately, have paid the penalty of pioneers in the great science and sport of flying, but many others are still to be met with in various places, and seldom does a month pass without one of the early members of the Club turning up unexpectedly on the Riviera. Recently I have run across J. H. Spottiswoode, whose enthusiasm for aviation entailed many horrible months of solitary confinement in Germany, where he happened to be visiting aerodromes when war was declared. Ridley Prentice, who was for years so ill that many of his friends were under the impression that he had gone to another world, is also staying near here. Mr. Napier, of aero-engine fame, has a fine villa and a yacht here, and Capt. Van der Byl lives in the town, where he was born, and Lieut.-Commander Barry, whose share in the organising of the historic raid on Friedrichhafen will be remembered, has just arrived in Cannes. Spenser Grey was here last year, and "Sunshine Rainey" achieved a certain amount of local prominence as skipper of a smart yacht using Cannes harbour last season

But what has become of Louis Noel, and Osipenko, and Reggie Carr, Marcus Manton—of the startling socks—and all the other old Hendon pilots? And Watkins, who once started for the South Pole with an aeroplane and was perhaps lucky in meeting with an accident in Australia, which prevented him from more serious dangers in the land of ice? And "Stream-line" Percival, Ronald Charteris, Harry Delacombe, Handasyde, Hubbard, Bernard Isaac, Oscar Morison, Raynham, Dukinfield Jones, Tilghman Richards, and a score of others whose names come to mind?

When a few of us get together, it is remarkable how amusing reminiscences crop up, and the time flies as we chat about the events which occurred in the old Club premises in Piccadilly.

I believe that if you could collect recent news about the many old hands now scattered all over the globe, some of them still in the aviation industry or the flying service, but others engaged in other trades and professions, you could produce a number of FLIGHT, which would be of great human interest. How does the idea strike you?

DOUGLAS W. THORBURN.

Cannes.
November 18, 1929.

[We should greatly like to have the views of readers on this suggestion.—ED.]

MONEY FOR AVIATION

[2224] In your report of the Authors' Club after-dinner discussion, you say I spoke of the need of more money in the aviation business.

My point is—we could spend £300,000,000 a year more on aviation, and yet have some thousands of millions a year more left over to spend on other things. The way to arrive at so desirable a situation is to relinquish our old habit of breaking one of the world's most unenviable records, viz., "excess of imports over exports."

No other country can anywhere near approach our insane record, which leads to soul-destroying unemployment, poverty, and over-taxation. Other progressive nations foresaw years ago this inevitable result of allowing imports to exceed exports. They accordingly safeguarded their industries, and are amazed at our delay in doing likewise, for they know that when we do, healthy internal competition will automatically bring about extraordinary prosperity and soul inspiring opportunities.

When Baldwin talked of safeguarding some few years ago, a number of applications for sites and works came from foreign industrialists, but they ran like rats from a sinking ship when it fell through.

By our folly we are not only holding up our own progress, but the progress of the world, for when we fall in line with other leading nations and introduce a judicious system of safeguarding, we shall all the sooner discover how to trade to our mutual advantage.

It seems inconceivable that a people could be so utterly devoid of sense as to continue importing goods, year after year, to the tune of hundreds of millions that could be advantageously produced by its million odd unemployed, and still more millions of inefficiently employed. Money left and spent in a country goes on creating wealth for that country, but we send it abroad, without let or hindrance, to help to strengthen rival industries.

Some of your readers may say, "What is this to do with aviation?" It has everything to do with it, for, after all is said and done, the industries of any country, including aviation, depend on the productivity and buying power of its people. We, therefore, cannot be surprised that we are

only spending a fraction of what other nations are spending on aviation, and that the Blackpool airport only had one landing fee of 1*s.* in four months!

If we produced as much per head as the Americans, we would be over £3,500,000,000 a year better off. We could produce this huge extra wealth with less exertion and worry than we are expending at the present time with the existing inadequate equipment, as we have unrivalled facilities for economical production.

Let us hope that "The Empire Economic Union," which has just been formed by leading industrialists, will put the country on the right track, for when we stop unnecessary imports, we shall enjoy ever increasing prosperity, and then we can rest assured that aviation will play a big part in the scheme of our affairs. I reminded the authors that they could do much towards moulding public opinion.

Saunders-Roe, Ltd., A. VERDON ROE
November 19, 1929.

TAILPLANE POSITION

[2225] I notice in your issue of November 15, on page 1214, a reference to the fact that we altered the position of the tailplane on the original Koolhoven monoplane. This is quite correct, and it made a tremendous improvement in the take-off of the machine, and, regarding the flying qualities, the reports of the various pilots who tested both machines were that this had not in any way been altered or spoilt.

With the tailplane in its original high position the slipstream of the propeller passed well below it, and therefore did not blow the tail off the ground, with the result that the tail only rose when the machine had gained considerable speed.

We should like to take this opportunity of saying that when this company acquired the rights of the Koolhoven monoplane, its object was to acquire the conception of this machine, and that before this company started production the whole machine was re-designed; and today, not only is the wing section different and the whole control system re-designed, but every fitting in the machine has also been re-designed, the object of this being to bring the design and method of construction up to British standards of airworthiness and workmanship, and also to make the maintenance of the various moving parts as easy as possible.

Although the complete re-designing of the original Koolhoven delayed us for two or three months, the greatly improved performance of the Desoutter sports coupé, and the very successful manner in which it passed its official tests at Martlesham, conclusively proves the wisdom of this policy.

DESOUTTER AIRCRAFT CO., LTD.,
A. M. DESOUTTER
November 21, 1929.

AVIATION CLASSES

[2226] I note that in your issue of November 1 you make reference to the classes which have recently been commenced at the de Havilland Aerodrome, Edgware, under the control of the Middlesex Education Committee. You will be interested to know that students are prepared for the Air Ministry's certificates, Category A, B, C, D, and X, and the Senior Classes prepare for the Associate Membership and Associate Fellowship of the Royal Aeronautical Society.

In most of the classes there are now no vacancies for students, but a few more can be included in the Senior Class. I should be grateful if, through the medium of your journal, you could make it known that a limited number of students may be admitted to fill these remaining vacancies. The fee for the session is 30*s.* or 15*s.* if single subjects are taken.

H. M. WALTON
Middlesex Education Committee.
November 19, 1929.

READING AERODROME

[2227] As there appears to be a considerable amount of misunderstanding as to the ownership of the Reading Aerodrome, we would like to correct rumours that are about.

It appears that a number of people have been told that we have disposed of the aerodrome to the National Flying Services, and are renting from them a portion for our hangar and workshops. This is incorrect. The aerodrome belongs to us. We have let an acre and a half to National Flying Services for the purpose of erecting a hangar, and have also given them flying rights on the aerodrome. They are definitely tenants of ours, and are restricted in many ways.

Should you receive a report contrary to this statement you will know that it is not correct.

p.p. PHILLIPS AND POWIS AIRCRAFT (READING) LTD.
C. O. POWIS,
Reading Aerodrome. Managing Director.
November 20, 1929.

P.S.—We would also beg to point out that we are not connected with the National Flying Services in any way.

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AIR MINISTRY NOTICES

AIR MINISTRY NOTICES TO AIRMEN

Reopening of Certain R.A.F. Air Stations

1. FURTHER to paragraph 3 of Notice to Airmen No. 32 of 1929, the undermentioned Royal Air Force air stations are again available for use by civil aircraft, subject to the usual conditions: Calshot seaplane station, Lee-on-Solent seaplane station, Gosport aerodrome.

2. The rules regarding the use of R.A.F. air stations by civil aircraft are given in the *Air Pilot* (1929 edition), vol. i., §§ 52–59.

3. *Cancellation.*—Notices to Airmen Nos. 32, 46, and 47 of 1929 are hereby cancelled.

(*No.* 65 *of* 1929.)

Flights to Egypt

1. THE permission of the Egyptian Government must be obtained in advance for all flights to or through Egypt.

2. The Egyptian Government requires 15 days' notice of all such flights, and an application for permission to make the flight should, therefore, be made by the pilot, to the Secretary, Air Ministry (D.D.C.A.), Gywdyr House, Whitehall, S.W.1 (Telephone No.: Victoria 1216); in sufficient time to enable this notice to be given. Six weeks is normally required for this permission to be obtained by the Air Ministry, unless the pilot of the aircraft authorises the application to be made by telegraph at his own expense. In this case, a deposit will be required.

3. The application should contain the following information: (i) Type of aircraft and engine; (ii) Registration marks; special marks or name (if any); (iii) Names of pilot and crew; (iv) Names of passengers; (v) Particulars of cargo and equipment (including radio apparatus, spare parts, cameras, arms, etc.); (vi) Date and place of departure; (vii) Final destination; (viii) Route through Egypt, proposed landing places, refuelling stations, and arrangements (if any) made for refuelling.

If the aircraft is to pass through Egypt on a return journey, similar details, as far as possible, in respect of such journey, should be furnished at the same time.

If for any reason other than *force majeure*, the proposed route and landing places have to be modified, full details must be furnished, as early as possible, to the Secretary, Air Ministry (D.D.C.A.)

4. The permission, if granted, remains valid for one month from the date specified as that upon which it is anticipated the Egyptian frontier will be crossed.

5. It is important that a telegram, notifying the registration marks of the aircraft, the name of the pilot, the date and anticipated time of arrival, be sent to the British High Commissioner in Egypt (Telegraphic address: "Prodrome Cairo") the night before the Egyptian frontier is crossed.

Arrangements will then be made by the Egyptian Ministry of Communications through the officer commanding the aerodrome, for the Egyptian Customs, Health and other necessary authorities to be present at the arrival of the aircraft in Egypt. The pilot in charge of the aircraft should therefore report, immediately on arrival, to the officer commanding the aerodrome, in order to facilitate the clearance of the aircraft and personnel.

6. It should be clearly understood that aircraft arriving in Egypt without the prior consent of the Egyptian Government having been obtained, will be liable to detention.

7. Civil pilots using Royal Air Force aerodromes in Egypt should report before departure to the Duty Officer, in order that the consent of the Commanding Officer may be obtained.

8. The attention of all pilots is directed to (Appendix A) King's Regulations made under Articles 144 and 145 of "The Ottoman Order in Council, 1910" and "The Egypt Order in Council, 1915," and to (Appendix B) Instructions for the Control of British Civil Aircraft and Pilots entering Egypt published with Notice to Airmen No. 67.

9. *Cancellation.*—This Notice supersedes the information regarding "Notification of flights by British aircraft," published in Supplement No. 34 to *The Air Pilot* (1924 edition).

(No. 67 of 1929).

Flights along the North Coast of Africa

THE following procedure is recommended to pilots of aircraft proceeding along the North coast of Africa:

1. Pilots should, on alighting, notify the last place of departure by telegraph. The next objective should also be notified by telegraph when the flight is to be continued. The telegrams should invariably be addressed to the Officer Commanding the air station or to the British Consul at the place concerned, and not solely to a petrol company's representative or other local agent.

2. Telegrams to the next objective should be despatched the night preceding departure, as delays frequently occur in the transmission of the messages. These telegrams should state the registration marks of the aircraft, the name of the pilot, and the anticipated date and time of arrival.

3. In the case of Benghazi or similar places where hotel accommodation is limited, the telegrams should include details as to the number of persons requiring accommodation and the proposed duration of the visit. Telegrams to H.M. Consul, Benghazi, should be prefixed with the word "Notte" and sent *via* Syracuse to avoid delay.

4. Owing to unsettled tribal conditions in certain territories in North Africa, pilots are advised to fly along the coast, as a forced landing inland might be attended by considerable danger.

(No. 68 of 1929).

AIR MINISTRY NOTICE TO GROUND ENGINEERS

D.H. 60 Aircraft: Retaining Washer, Part No. H. 16132, for Aileron King Post Ball Joint

ATTENTION is drawn to the above-mentioned washer, Part No. H. 16132 on D.H. 60 type machines. Owing to this washer having been reversed on one of the above aircraft, a failure at the shank of the rear end of the aileron gear connecting rod, Part No. H.11801, has resulted.

Ground engineers should, therefore, make a special examination of this washer on all machines of the above type under their supervision.

(No. 22 of 1929.)

THE ROYAL AIR FORCE

London Gazette, November 19, 1929.

General Duties Branch

Capt. D. A. Fletcher (Camerons, R.A.R.O.) is granted a short service commn. as Flight Lt. for three years on active list (Nov. 4); Lt. G. R. M. Robertson, R.N., is re-attached to R.A.F. as Flying Officer with effect from Nov. 2 and with seny. of June 16, 1924; Pilot Officer G. C. Butler is promoted, to rank of Flying Officer (Oct. 8); Flying Officer R. Matheson takes rank and precedence as if his appointment as Flying Officer bore date Sept. 17. Reduction takes effect from Sept. 21; Pilot Officer B. F. Cox is placed on retired list on account of ill-health (Nov. 6). The follg. Air Commodores are placed on retired list at their own request (Nov. 15):—B. C. H. Drew, C.M.G., C.B.E., E. L. Gerrard, C.M.G., D.S.O.

Pilot Officer E. J. Brighton is transferred to Reserve, Class A (Nov. 19); Lt. Count A. D. R. Metaxa, R.N., Flying Officer, R.A.F., relinquishes his temp. commn. on return to Naval duty (Sept. 26).

Medical Branch

The follg. Flying Officers are promoted to rank of Flight Lt. (Nov. 15):—D. A. Wilson, F. E. Lipscomb, M. Clancy, C. P. O'Toole, G. H. J. Williams, S. B. S. Smith, V. V. Brown, J. F. McGovern, M.B., W. Heron, M.B.. Lt. C. M. Leckie (General List, Army, Dental Surgeon) is granted a temp. commn. as Flying Officer (Dental) on attachment to the R.A.F. (Oct. 18); Capt. R. E. Edwards (Army Dental Corps) is granted a temp. Commn., as Flight Lt. (Dental) on attachment to R.A.F. (Nov. 8); Flight Lt. P. P. Hogan (Capt. Army Dental Corps) relinquishes his temp. commn. on return to Army duty (Nov. 8).

ERRATUM.—*Gazette* of Nov. 12 (FLIGHT, Nov. 22, p. 1251):—Promotions to Flight Lt. and Squadron Leader.—For Oct. 13 read Nov. 13.

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The Honourable Henry C. H. Bathurst is granted a commn. in the special Reserve as Pilot Officer on probation (Oct. 26); Flying Officer R. P. D. Brailli is transferred from Class A to Class C (Nov. 8).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Air Vice-Marshal T. I. Webb-Bowen, C.B., C.M.G., to R.A.F. Depot, Uxbridge.

Wing Commanders: E. A. B. Rice, M.C., to No. 216 Sqdn., Middle East, to command, 9.11.29. A. C. Wright, A.F.C., to R.A.F. Depot, Uxbridge; attending course at Senior Officers' School, Sheerness, 2.11.29. F. P. Don, to No. 502 Sqdn., Aldergrove, to command, 2.11.29.

Squadron Leaders: C. B. Cooke, to Night Flying Flight, Biggin Hill, 1.11.29. R. M. Drummond, D.S.O., O.B.E., M.C., to R.A.F. Depot, Uxbridge, 15.11.29. A. P. Maurice, D.F.C., to Elec. and Wireless Sch., Cranwell, 11.11.29. R. Young, to No. 9 Sqdn., Manston, 18.11.29. C. E. W. Foster, to R.A.F. Depot, Egypt, 9.11.29. P. C. Sherren, M.C., to Armament and Gunnery Sch., Eastchurch, 3.11.29.

Flight Lieutenants: E. A. C. Britton, D.F.C., to No. 1 (Indian) Group H.Q., 8.10.29. T. C. Luke, M.C., to No. 21 Group H.Q., West Drayton, 1.11.29. L. Wanless-O'Gowan, to R.A.F. Depot, Uxbridge, 10.9.29. C. W. Attwood, to R.A.F. Depot, Uxbridge, 11.11.29. W. R. Day, to H.Q. Fighting Area, Uxbridge, 17.10.29. B. Ankers, D.C.M., to No. 2 (Indian Wing) Station, 13.10.29. A. Jerrard, V.C., to No. 5 Flying Training Sch., Sealand, 23.10.29. M. D. Ommanney, to No. 28 Sqdn., India, 9.10.29. N. S. Paynter, to No. 1 (Indian) Group H.Q., 23.10.29. I. E. Brodie, to R.A.F. Depot, Uxbridge, 12.10.29. J. E. L. Drabble, to No. 45 Sqdn., Middle East, 1.11.29. W. J. Pearson, to No. 55 Sqdn., Iraq., 9.11.29. D. A. Fletcher, to H.Q. Iraq Command, 9.11.29.

Flying Officers: A. H. Wheeler, to Aircraft Depot, Iraq, 9.11.29. L. B. McGoverne, to R.A.F. Depot, Uxbridge, 28.9.29. W. J. Pickard, to Aircraft Park, India, 7.10.29. P. G. J. Atkinson, to No. 11 Sqdn., India, 3.10.29. R. C. Greenhalgh, to No. 1 Flying Training Sch., Netheravon, 7.11.29. J. S. Phillips, to No. 1 Sch. of Tech. Training (Apprentices), Halton, 26.10.29. J. Rodger, D.S.M., to Station H.Q., Mount Batten, 5.11.29.

Pilot Officer M. E. Morris, to No. 12 Sqdn., Andover, on appointment to a Short Service Commn., 6.11.29.

Stores Branch

Flight Lieutenants: H. Jones, to Station H.Q., Tangmere, 5.11.29. F. W. Taylor, to Station H.Q., Manston, 5.11.29. J. J. Ironmonger, to Station H.Q., Mount Batten, 4.11.29.

Flying Officers: C. I. Fry, to R.A.F. Depot, Egypt, 19.10.29. W. A. Stagg, to No. 2 (Indian Wing) Station, 8.10.29. M. J. Scott, to No. 6 Sqdn. Middle East, 26.9.29.

Accountant Branch

Flight-Lieutenant F. C. Langley, to Marine Aircraft Experimental Estabt., Felixstowe, 11.11.29.

Flying Officer R. Cassells, to H.Q. Iraq Command, 9.11.29.

Medical Branch

Flight Lieutenants: C. W. Coffey, to H.Q. Air Defence of Gt. Britain, Uxbridge, 30.10.29. M. O'Regan, to R.A.F. Depot, Uxbridge, 17.10.29. P. P. Hogan, to R.A.F. Depot, Uxbridge, 21.10.29. R. A. W. Kerr, M.B., to Station H.Q., Mount Batten, 4.11.29.

Flying Officers: A. E. Vawser, to R.A.F. General Hospital, Iraq, 8.10.29. H. C. S. Pimblett, M.B., B.S., to R.A.F. General Hospital, Iraq, 8.10.29. C. P. O'Toole, to Marine Aircraft Experimental Estabt., Felixstowe, 7.11.29.

NAVAL APPOINTMENTS

The following appointment was made by the Admiralty on November 22:—Lieut. J. H. F. Burroughs (F./O., R.A.F.), to *Furious* (Dec. 3).

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IN PARLIAMENT

THE HOUSE OF LORDS

The R 101

LORD NEWTON, on November 20, in asking the Secretary of State for Air why the airship cruise arranged for last Saturday was abandoned, said he believed this form of locomotion to be a form of public extravagance largely stimulated by the Press and a concession to sensation.

LORD THOMSON said he had yet to find the organs of the Press, with the exception of *The Times*, the *Telegraph* and the *Manchester Guardian*, which had encouraged the Government in this "form of public extravagance." Until the success of the first few flights was undeniable, most of the newspapers denounced airships in no unmeasured terms, and he had received letters in which it was said that he was little short of a murderer. It was not at all on account of the roughness of the weather that the proposed flight last Saturday was postponed. This new ship had stood up to weather at least four times as bad from the point of view of the force of the wind as was experienced last Saturday. The ship had been in the air since November 1—19 days. She had never been in her shed. Moored at the mast she was exposed to far greater strains than when she was loose in the air. At the mast the whole of the strain due to wind pressure was at the nose. The wind rose to gusts of 83 miles an hour while she was moored. The pressure at the nose was recorded at 15¼ tons; her strength was calculated to meet a pressure of 30 tons at the nose. When the pressure of 30 tons was reached—should it be reached, and in view of the excellent streamlining of the ship it did not seem very likely—all that would happen would be that the order would be given to "Slip the ship." In other words, the ship was a great deal more capable of resisting wind pressure loose than she was tied. The result that had already been achieved was a matter of extreme gratification to the designer, and a reasonable cause of optimism as regarded the success of this experiment.

The reason why, on a day when the average pressure of the wind was about 25 miles an hour only, the flight was postponed was that on this occasion the Air Ministry wanted to give Members of Parliament an enjoyable demonstration of what an airship could do. What were the weather conditions? A layer of cloud lay over these islands the lower level of which was 450 ft. above the ground, and the top layer was something like 10,000 ft. up. The conditions of visibility, therefore, for the passengers that they hoped to take up would have been about as bad as they could have been. On the normal cruise they would have seen nothing but driving rain. One of the great features of the airship, and one of its great advantages as a form of locomotion, and one which, in his opinion, would make it popular provided these experiments succeeded, was the spacious prospect, the magnificent view that was obtained from it—far superior to anything that one obtained from any other vehicle, including the aeroplane. This pleasure would have been denied to the Members of Parliament who proposed to travel last Saturday.

He wished to express the Air Ministry's great regret and disappointment that members of both Houses were disappointed. They made every possible arrangement for their comfort, down to the provision of a very excellent lunch and liquid refreshments. They wanted the Members of Parliament to enjoy themselves. The Ministry felt certain that they could not possibly enjoy themselves on a day such as last Saturday was. It was, in the opinion of the Air Ministry, unsuitable weather for the sort of entertainment that had been planned, and for that reason, and that reason alone, the flight was postponed. He sincerely hoped it would be possible for the flight to take place next Saturday. He hoped that there would be a fresh breeze of 40 to 45 miles an hour blowing on the trip, and that there would be bright sunshine, so that those who went on the trip might have a splendid view. He was sure that the noble lords and members of the other House, who went would enjoy themselves thoroughly. He was almost certain, from his own experience in the ship, that they would be able to enjoy their lunch.

In the unfortunate event of similar weather to that which prevailed last Saturday, he was afraid that they would have to postpone the flight again, and postpone it for a very long time. R.101 had now practically concluded her tests, and there was another ship to be tried out. That ship was not quite ready, but they hoped that it might be ready some time next week. There was only one mast; therefore, R.101 would have to leave it, and the other ship would take its place.

The Air Ministry were very much on their mettle in this matter. They were praying more earnestly than anybody for a flight. R.101, he would like to remind their lordships, had, since the postponed flight, flown 1,200 miles—a circuit of these islands almost—in fog, rain, and mist, had found its way back, and was moored in a very dense fog. That was really a rather remarkable achievement, due to the refinement of direction by means of wireless. There had been a great deal of inaccurate information in the Press as to the cost of this airship, and the airship programme generally. He hoped at no distant date to be able to prove to their lordships that the amount of scientific knowledge acquired by these experiments would alone almost have justified the expense incurred.

LORD NEWTON, on November 26, asked the Secretary of State for Air if he had any fresh statement to make in regard to past and prospective flights in the airship R 101. He could not understand why the Air Ministry had built two airships simultaneously.

Lord Thomson (Secretary of State for Air) said that the reason why there were two airships was given in 1924 by himself, in a very long oration on the subject of airships. They were trying out two sorts of designs. The difference between the two airships was very marked indeed. For example, the R.101 had a Diesel engine, which marked a completely new departure in aircraft engines. The R.100 had got the ordinary petrol engine, and there were other differences. The contract for the other airship was given to the Airship Guarantee Company in order that that company might be rewarded, and its chairman, Sir Dennistoun Burney, in particular, for having kept alive

airships during the period of neglect and depreciation from which they suffered for several years. He (Lord Thomson) could only express regret that the very gallant visitors on Saturday had such bad luck. In 16 days there had been only two days unsuitable for airship navigation, and those two days happened to be the two selected.

The conditions under which the airship was riding on Saturday were somewhat remarkable. On that day, the British battleship Malaya was held up for 30 hrs. from getting into Plymouth harbour. All along the east and south coasts, shipping was held up, while a great 20,000-ton liner, which had crossed the ocean many times, was weather-bound at Liverpool. Football matches were abandoned, bookmakers ceased to quote the odds, and, in fact, we were living under conditions which were so abnormal that Lord Newton and his friends might consider themselves extremely lucky not to have been blown away. The highest compliment that could be paid to the strength of the R.101 was that she was still there, and that Lord Newton was in that House that night. He certainly would not fix a definite date again, if he could help it, for the M.P.'s flight.

THE COMMONS

Civil Flying Clubs

MR. MONTAGUE, on November 15, in reply to Sir R. Gower, said the following list gives the names and the latest available information regarding the number of flying members of the subsidised light aeroplane clubs: London (285 members), Midland (150), Lancashire (180), Yorkshire (159), Newcastle-upon-Tyne (181), Hampshire (275), Bristol and Wessex, (119), Norfolk and Norwich (102), Nottingham (61), Scottish (228), Suffolk and Eastern Counties (94), Cinque Ports (94), Liverpool and District (119).

With the exception of the Northamptonshire Aero Club, which is understood to have 72 members, no information is available in regard to the membership of unsubsidised and Service clubs, but the names of the clubs are as follows:

Unsubsidised clubs: Southern, Leicestershire, Berks Bucks and Oxon, The Household Brigade Flying Club, Derby and District, Southport, The Flying Club of Ulster. Service Clubs: Halton, Royal Aircraft Establishment (Farnborough), Marine Aircraft Experimental Establishment (Felixstowe).

In addition, National Flying Services, Ltd., have established clubs at Hanworth, Reading and Hull, which, up to date, have a flying membership of 464, 69 and 39 respectively.

Schneider Cup

MR. MONTAGUE, on November 20, in reply to Sir C. Cayzer, said the Air Ministry, before making the announcement that a Royal Air Force team would not participate in the next contest for the Schneider trophy, had not received any assurances as to the intention of any foreign Government to also abstain from official participation.

Sir C. Cayzer: Does not the hon. Member think that in the absence of any such assurances, the action of the Air Ministry is tantamount to making a present of the Schneider trophy to the first foreign country that cares to compete? Mr. Montague: I think that question has already been answered.

Municipal Aerodromes

MR. MANDER asked the Under-Secretary of State for Air whether, in view of the difficulty which local authorities are experiencing in obtaining land suitable for aerodromes, the Government will consider the question of granting them compulsory powers? Mr. Montague: This question is under consideration.

Airship R. 101

MR. MONTAGUE, on November 21, in reply to Mr. Naylor, said the average weekly cost for the few weeks during which R 101 has been in the air, inclusive of hydrogen, as well as the services mentioned, has worked out at approximately £600. The repairs included are only running repairs while at the mooring tower. Expenditure on fuel is not included, as it varies directly with the amount of flying. Much longer experience will be necessary before it is possible to give an all-in average figure which would be useful as a guide to the cost of commercial operations.

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Bumpiness on the Cairo-Basra Air Route

SOME interesting facts regarding bumpiness on the Cairo-Basra section of the England-India air route are brought out in a paper by J. Durward, of the Meteorological Office, Heliopolis, issued by the Air Ministry, Meteorological Office (Professional Notes No. 52). The data are based on the reports of pilots of Imperial Airways, Ltd., who fly regularly along this route. An analysis of these reports has enabled the author to compare the various sub sections of the route between Cairo and Basra as regards bumpiness, and also to discuss the relation which bumpiness bears to the time of day at which flying takes place, and also to special meteorological conditions. The route between Baghdad and Basra lies over the Mesopotamian desert and as this route is subject to dust and sand storms, one would expect flying to be very bumpy. The report, however, is reassuring from this point of view. In fact, the author finds that the worst part of the route from the point of view of bumpiness is the belt of country known as Trans-Jordan, where the surface is very irregular and, owing to its nature, readily becomes heated by the sun's rays during the day. Even along this portion of the route there may be a complete absence of bumps in certain meteorological conditions. Speaking generally, the air is more bumpy near the ground, and frequently the pilot is able to avoid the bumps altogether by climbing to a sufficient height. On occasions, however, the air is found to be bumpy, even at a height of 12,000 ft. Interest is added to the paper by references to particular experiences of individual pilots. The paper can be obtained from H.M. Stationery Office, Kingsway, W.C.2, price 3*d*. net.

Change of Address

WILL readers please note that the address of Alan Cobham Aviation, Ltd., and Cobham Blackburn Airlines, Ltd., is now Grand Buildings, Trafalgar Square, London, W.C.2. Telephone: Regent 5316. Telegrams and Cables: Chyjayrob Westrand London.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda: *No.* 1244 (*M.* 63).—The influence of Oxygen on Corrosion Fatigue. By A. M. Binnie, M.A. Mar., 1929. Price 6*d*. net. *No.* 1257 (*Ae.* 406).—Comparison of Calculated and Measured Elasticity of the Wings of an Aircraft, in Connection with the Investigation of Wing Flutter. By K. T. Spencer. April, 1929. Price 9*d*. net. *No.* 1258 (*Ae.* 407).—Notes on the Flutter of Airscrew Blades. By E. Lynam. April, 1929. Price 6*d*. net. *No.* 1261 (*Ae.* 410).—Experiments on the Spinning of a Bristol Fighter Aeroplane. By K. V. Wright. May, 1929. Price 6*d*. net. *No.* 1263 (*Ae.* 412).—Full-Scale Determination of the Motion of an Avro Aeroplane when Stalled. By K. W. Clarke and W. G. Jennings. April, 1929. Price 9*d*. net. H.M. Stationery Office, Kingsway, London, W.C.2.

Department of Overseas Trade: The Economic and Financial Situation in Egypt. June, 1929. Report by R. M. Turner, O.B.E. H.M. Stationery Office, Kingsway, London, W.C.2. Price 2*s*. 6*d*. net.

S.M.A.E. Journal. October, 1929. Society of Model Aeronautical Engineers. W. E. Evans, 20, Thurlby Road, Wembley, Middlesex. Price 6*d*.

The Fund Journal. No. 2. *Autumn*, 1929. The Motor and Cycle Trades Benevolent Fund, 42, Bedford Row, London, W.C.1.

Report on the Progress of Civil Aviation, 1928. *Air Ministry—Directorate of Civil Aviation*. H.M. Stationery Office, Kingsway, London, W.C.2. Price 3*s*. 6*d*. net.

Professional Papers of the Air Survey Committee.—No. 6. *Extensions of the "Arundel" Method*. By Capt. M. Hotine, R.E. (The War Office.) H.M. Stationery Office, Kingsway, London, W.C.2. Price 4*s*. net.

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AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations:* Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

APPLIED FOR IN 1928

Published November 21, 1929

24,638. F. H. ROYCE. Pistons for i.c. engines. (320,997.)
28,195. G. L. R. J. MESSIER. Suspension apparatus for aeroplanes, etc. (321,035.)
31,449. DUNLOP RUBBER CO., LTD., E. F. GOODYEAR and J. WRIGHT. Disc wheels for aeroplanes. (321,057.)
31,450. DUNLOP RUBBER CO., LTD., E. F. GOODYEAR and J. WRIGHT. Rims of disc aeroplane wheels. (321,058.)
33,807. C. R. FAIREY. Flying boats. (321,074.)
35,976. SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT, LTD., J. LLOYD and C. V. MURRAY. Steering mechanism of aircraft (321,087.)

Published November 28, 1929

12,902. L. MARMONIER. Gyroscopic stabilising-apparatus. (290,203.)
21,468. J. A. DAVIES. Means for supply of combustion air to i.c. engines. (321,149.)
33,231. SOC. ANON. DES ATELIERS D'AVIATION L. BREGUET. Braking-controls for aeroplane wheels by means of pneumatic power transmission gear. (318,192.)
35,890. J. DE CHAPPEDELAINE. Bearing, propelling and steering apparatus for aircraft operating by centrifugal force. (30,154.)
37,690. ROHRBACH METALL-FLUGZEUGBAU GES. Metal aircraft wings. (303,360.)

APPLIED FOR IN 1929.

Published November 28, 1929

2,681. C. O. PREST. Aeroplanes. (321,364.)
5,411. H. JUKNERS. Flying machines. (306,410.)
5,412. H. JUNKERS. Flying boats. (306,411.)

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